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Cleaner Production

Seventh International High-level Seminar
Prague

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Editorials

Cleaner Production: Seventh International High-level Seminar, Prague

Klaus Toepfer

United Nations Under Secretary-General and Executive Director, UNEP

UNEP's Seventh International High-level Seminar on Cleaner Production (CP7) sent a clear message that it is crucial to integrate cleaner production more deeply with sustainable consumption. The more than 350 senior decision-makers from government and business who met in Prague for CP7 in April 2002 stressed that everyone, as private citizens and through the institutions we represent, must contribute to sustainable development by changing production and consumption patterns.

The focus of CP7 was on taking stock of what has been accomplished, establishing the importance of linking cleaner production with sustainable consumption, and preparing input for the World Summit for Sustainable Development (WSSD) in August and September in Johannesburg. At the Rio Earth Summit in 1992, participants were so sure cleaner production would succeed that they did not realize implementation would require so much follow-up work. For all stakeholders (government, industry, the public) implementation and ongoing support were the missing links. Now, after WSSD, we must ensure that education and action follow.

Let me recall a few sobering statistics. Since 1992 the global population has increased by nearly 800 million. Fifty years ago Africa had one-third as many people as Europe. Now the opposite is the case. High-income countries continue to consume the bulk of the planet's resources, even as consumption in low-income countries is increasing.

Since Rio, UNEP has been monitoring progress around the world on cleaner production and similar approaches such as eco-efficiency and green productivity. It has become increasingly evident that the environmental gains achieved by such programmes are being offset by trends on the demand side – population growth, rising standards of living, increasing demand for products and services. This "rebound effect", as it is usually called, means that it is ever more urgent to switch to sustainable consumption in addition to cleaner production.

If the overall aim of cleaner production is to minimize the environmental impact of a product's manufacture, sustainable consumption means satisfying a maximum of consumer needs and wants while minimizing the environmental impacts of products and services.

The challenge we face is to establish a framework for action in which producers and consumers can move together towards sustainable development. Only by taking a preventive environmental management approach throughout the product's life cycle – from design and manufacture through use and disposal – will we be able to advance towards the objective of "doing more with less."

In this connection, CP7 was the occasion for launching the Life Cycle Initiative, a joint effort between UNEP and the Society of Environmental Toxicology and Chemistry (SETAC). This initiative will develop and disseminate practical tools for evaluating the opportunities, risks and trade-offs associated with products and services over their entire life cycle.

"Life-cycle thinking" and related approaches will succeed only through cooperation and collaboration by private enterprise, government and the public. The Czech Republic's young economy provides a good example. New technical approaches, a well-educated generation of young people, and visionary leadership are putting this country on the path to sustainability – which is especially important as the Czech Republic prepares to join the European Union.

Other examples of the efforts that will be required to meet this challenge include:

- ◆ integrating environmental costs into prices, not to punish people but to stimulate new technology;
- ◆ finding ways to manage the growing demand for water, including through cleaner production;
- ◆ cooperating with private business;
- ◆ integrating financial institutions into the process of change;
- ◆ using eco-labelling to inform consumers about products' life cycles;
- ◆ initiating take-back systems for cars and other products;
- ◆ working with the media to help change consumption patterns;
- ◆ involving young people.

This double issue of *Industry and Environment* is devoted to summarizing the results of CP7, including such recommendations as building better links between cleaner production and multilateral environmental agreements (MEAs); expanding the network of UNEP/UNIDO National Cleaner Production Centres (NCPCs); further encouraging investment in cleaner production; and expanding activities related to consumption. Many of the articles in this issue present concrete examples of the links between cleaner production and sustainable consumption and how they relate to the challenges ahead. ◆

Milos Kuzvart

Minister of the Environment, Czech Republic

At UNEP's Sixth International High-level Seminar on Cleaner Production, hosted by the Canadian Government in Montreal, I pledged the support of the Czech Republic for the seminar to follow. The intervening time spent organizing CP7 furnished the opportunity to collaborate with international partners and to review current cleaner production activities in my own country. I am pleased to say the experience has been extremely fruitful for all involved. In particular, it has given Czech stakeholders from ☞

industry, government and civil society a unique occasion to review our progress and plan our sustainable future. UNEP's Seventh International High-level Seminar on Cleaner Production set the stage for the World Summit on Sustainable Development (WSSD) in Johannesburg later in 2002. The Czech Republic's 1992 Act on the Environment defines "sustainable development" as development that preserves, for the present and future generations, the ability to satisfy these generations' basic needs, and simultaneously does not decrease natural diversity or hinder the natural functioning of ecosystems. Sustainable development is thus a question of creating a balance between the ideals of humanism and nature protection, of preferring a long-term perspective over short-term gain, and of humility and respect for everything that has been created without human effort.

Cleaner production plays a critical role with respect to influencing changes in consumption and production patterns. These changes are driven by both regulatory and voluntary initiatives. The Czech Republic has developed an effective National Programme of Labelling Environmentally Friendly Products, a National Cleaner Production Programme and a National EMAS (Eco-Management and Audit Scheme) Programme. In addition, the Government has introduced principles for concluding voluntary agreements and prepared a methodology for implementing life-cycle assessment (LCA) for enterprises and consultants. We have also taken an important step towards the "greening" of our government. A recommendation that all ministries preferentially purchase environmentally friendly products has been issued. The Government will evaluate follow-through on this recommendation annually. Information dissemination, training and public education campaigns that foster sustainable consumption and production are especially important.

We were very pleased with the involvement of a number of companies and organizations, including the Czech National Cleaner Production Centre and Czech companies and associations. Some CP7 participants have highlighted their commitment by adding their signatures to the International Declaration on Cleaner Production. All the seminar participants, and all those who will be involved in changing production and consumption patterns in the weeks and months following WSSD, face a great deal of work.

Given the spirit and energy I have seen, I am convinced that CP7 will contribute significantly to the deliberations on changing patterns of production and consumption, leading eventually towards sustainable development. ◆

The concept, the challenges and the way forward

Arcado D. Ntagazwa

MINISTER OF STATE, TANZANIA

The world community is fast realizing that, today more than ever, there exists a compelling sense of collective responsibility for the survival of humankind. As people the world over deploy and employ all kinds of natural and man-made resources, either to eke out a living or to pursue profit-driven ventures, it is essential to apply integrated preventive techniques to processes, products and services so as to increase overall efficiency and reduce risks to humans and the environment.

To avoid jeopardizing future generations, the world community must ensure that services and products respond to basic needs and improve the quality of life while minimizing use of natural resources and toxic materials (as well as waste generation and polluting emissions) over the life cycle. That is the ultimate goal of sustainable development, which requires adoption of sustainable consumption and production practices.

Cleaner production involves striving for a fairer society by defending consumer rights and promoting responsible, sustainable consumption by everyone. Meeting consumer needs and desires, while promoting cleaner production and sustainable consumption, is one of the greatest challenges facing humankind. Addressing poverty and environmental degradation requires changing how goods are produced, distributed and consumed. It also requires conservation and more efficient use of resources such as energy, together with action-oriented thinking. There is no excuse for doing otherwise.

Consumers have a duty to help push societies and nations towards socio-economic justice, sustainable development, prosperity and environmental quality. They also have a right to expect business operations (including all stages of production, distribution and marketing) not to compromise consumer interests or to harm the environment.

Whenever humans must accomplish something, challenges crop up. Cleaner production is no exception. It is a fairly recent concept. Experts, particularly in developing countries, may be rather scarce and training programmes may not yet have caught on. Willingness to finance cleaner production may be weak, partly due to financial institutions' misconceptions. Other obstacles include the erroneous idea that changing production and consumption patterns means fewer goods produced, or lower quality services. In reality, the benefits of cleaner production can be clearly demonstrated.

Many global resources are finite. Any strategy focusing on their efficient use (which is what cleaner production is all about) should be promoted. Some may hope that, in time, science and technology will solve all problems, but who knows what nature has in store in the near future?

As Nikita N. Moiseev, a member of the Russian Academy of Sciences, says in his 1998 book *To Be or Not to Be: Humanity's Dilemma*, "Man himself poses the main threat to the biosphere's stability. During the past three centuries the biosphere has been subjected to increasing, and ever more burdensome, anthropogenic loads. These are not only causing the degradation and restructuring of the biota, they are also resulting in a drastic reduction in the diversity of plant and animal life, thus posing a grave threat to the stability of the biosphere as a whole."

It is obvious that humankind cannot simply sit by and do nothing in the face of the deadly menace this implies. The way forward involves unreservedly agreeing to fully implement such strategies as cleaner production – in deeds, not just in words. ◆

Introduction

Jacqueline Aloisi de Larderel
UNEP Assistant Executive Director
Director, Division of Technology, Industry and Economics

The International High-level Seminar on Cleaner Production covered in this issue of *Industry and Environment* is the seventh such seminar organized by UNEP since 1989. In that year we launched the cleaner production programme to promote the seemingly simple idea that prevention costs less than cure.

Starting with the first seminar held in Canterbury in 1990, our aim has been to provide a global forum devoted to reorienting work programmes, building partnerships to promote action, and reviewing progress made and actions still needed.

At the Canterbury seminar the term "cleaner production" was formally adopted. It was defined as "the continuous application of an integrated preventive environmental strategy to processes, products, and services to increase overall efficiency, and reduce risks to humans and the environment" – and as applicable "to the processes used in any industry, to products themselves and to various services provided in society." Cleaner production means that, instead of managing outputs of emissions and waste, producers improve management of raw materials and other inputs, such as energy and water, from the moment a product or process is conceived.

The cleaner production concept received further support at Rio in 1992. It has been evolving and expanding ever since. This programme was designed as a "partnership" long before that term gained its current popularity. It is a partnership with other intergovernmental organizations, such as the United Nations Industrial Development Organization (UNIDO), the World Bank, the Asian Development Bank, the Organisation for Economic Co-operation and Development (OECD) and – underlining the workforce's role in cleaner production – the International Labour Organization (ILO). It is also a partnership with industry, NGOs and governments, not least the governments that have hosted the high-level seminars, from the United Kingdom in 1990 (and again in 1996) to France, Poland, Korea, Canada and now the Czech Republic.

The road to cleaner production is not free of obstacles by any means. One barrier to adopting prevention-based approaches is resistance to change. Another barrier involves preconceived ideas about the amount of investment and possible unknown risks. Despite these and other challenges, cleaner production is making headway. Its benefits are clear: not only do producers save money on end-of-process treatment, they also save on raw materials at the beginning of the chain. Cleaner production reconciles economic growth and environmental protection. The economic benefits are even greater when the polluter pays principle is applied, so that the environmental and other real costs of production are fully taken into account.

The cleaner production programme's achievements are demonstrated clearly in the 22 sectoral reports that UNEP launched in 2002. These reports show that production processes have improved. Step by step, the cleaner production programme has expanded to areas such as product design, life-cycle approaches and consumption. Concrete expressions of its achievements include the regional round tables on cleaner production and, at the national level, the increase in the number of UNEP/UNIDO National Cleaner Production Centres world-wide. Another milestone is the International Declaration on Cleaner Production introduced at CP5 in Seoul in 1998. This declaration is an expression of signatories' commitment to cleaner production.

As the sectoral reports and other evidence also show, the progress already achieved makes it clear how much still needs to be done. Many parts of industry, particularly small and medium-sized enterprises, have not yet adopted cleaner production. Life-cycle thinking must be given higher priority. Furthermore, we must change the way people commonly misunderstand the need to drastically alter consumption patterns: it is often still seen as a threat, rather than an opportunity for innovation and for overall improvement to quality of life.

In this context the delegates to the World Summit on Sustainable Development agreed to "encourage and promote the development of a ten-year framework of programmes in support of regional and national initiatives to accelerate the shift towards sustainable consumption and production." This agreement marks a new phase in the efforts of all those working on cleaner production and sustainable consumption. UNEP looks forward to contributing its expertise as the ten-year work plan unfolds.

The task emerging is quite clear: integrating cleaner production and sustainable consumption. I invite you to discover, in this issue of *Industry and Environment*, where and how progress is being made, who is involved, and the commitments that have been made to take action to meet the challenges we face.

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Acknowledgements

UNEP would like to express its appreciation to the government of the Czech Republic and to the Czech Environment Minister, Milos Kuzvart, for hosting the Seventh International High-level Seminar on Cleaner Production. Thanks in particular to Mr. Kuzvart for actively promoting cleaner production in connection with the last two high-level seminars.

Special thanks also to Arcado Ntagazwa, Minister of State, Office of the President, Tanzania. His vision of cleaner production as an important building block of sustainable development – indeed, as the cornerstone of sustainable development – has been a vital element in encouraging related activities in his county.

We are extremely grateful to the keynote speakers: Lorraine Maltby, President of the World Council of the Society of Environmental Toxicology and Chemistry (SETAC); Christian Kornevall, Senior Vice President and Head of Sustainability Affairs at ABB; and Isabelita Sy-Palanca, Chair of the Philippines National Steering Committee on the Global Compact, Charter President of the Women's Business Council, and Philippines Commissioner for Business and Industry.

The seminar would not have been possible without the staff of the Czech Environment Ministry. We are indebted to them for their assistance in planning and organizing the seminar, and for hosting the cultural events.

Last but by no means least, we express our thanks to the governmental, non-governmental, business, academic and international agency representatives who attended the seminar, served as chairs, speakers, panellists, rapporteurs and participants, and contributed to the recommendations and other outcomes, thus demonstrating their commitment to sustainable production and consumption.

Presentation and background

This special double issue of *Industry and Environment* covers the Seventh International High-level Seminar on Cleaner Production (CP7), which took place on 28-30 April 2002 in Prague. It was organized by UNEP and the Ministry of Environment of the Czech Republic, and hosted by the Czech government.

One key point made at CP7 was that cleaner production and sustainable consumption together form one of the most important building blocks of sustainable development. UNEP has been working to ensure that these concepts are properly integrated.

The importance of combining the two concepts was underlined earlier in 2002 when, as part of preparations for the World Summit on Sustainable Development (WSSD), UNEP facilitated reporting by 22 industry sectors on their progress towards sustainability and work that remains to be done. Among the findings of this project is that, while industry has made environmental improvements, such progress is neutralized as consumption grows.

In advance of WSSD and CP7, UNEP also issued status reports concerning progress to date on cleaner production and sustainable consumption. Advances and challenges highlighted in the reports are summarized below.

Cleaner production

Tangible progress world-wide with respect to cleaner production includes:

- a network of over 100 Cleaner Production Centres, operating in all regions to deliver technical assistance, training and information, and other services at the local and national level;
- roundtables in Africa, the Asia-Pacific region, Europe and the Americas that have facilitated information dissemination and exchange of experience between and across regions;
- over 100 educational institutions that offer courses on cleaner production, educating thousands of students as well as in-job professionals;
- over 1000 demonstration projects in various countries, providing undeniable proof of the tremendous scope for reducing material and energy intensity in production processes, and therefore reducing waste and pollution;
- the establishment of institutional mechanisms for transfer and adoption of cleaner technologies, which has contributed to greater uptake of such technologies;
- cleaner production financing programmes and related technical assistance, enabling practical application of cleaner production measures and installation of safer and cleaner technologies by many major companies.

Nevertheless, considerable scope remains to further strengthen and integrate cleaner production.

Strategies proposed include:

- formally integrating cleaner production and sustainable consumption to facilitate the adoption of an approach covering the entire life cycle of a product or service, expanding the horizon from production facilities to product use and disposal;
- "mainstreaming" cleaner production into national and local development planning processes and policy frameworks;
- expanding the network of cleaner production centres and institutions, as well as their roles and capabilities;
- linking related issues, such as implementation of multilateral environmental agreements, energy efficiency, health and safety, and environmental management systems;
- increasing outreach to small and medium-sized enterprises, to help them apply cleaner production measures;
- encouraging greater participation by the private sector in technology development and cooperation, financing of cleaner production investment, and market building.

Sustainable consumption

Consumption patterns throughout the world continue to threaten sustainable development. Of particular concern are the growing disparities between rich and poor countries' consumption levels and between consumption levels within developing countries, as well as the fact that total growth in use of resources (particularly water, food and energy) in developed countries is offsetting technologically engendered efficiency improvements.

Progress towards sustainable consumption must be made in industrialized countries, which are the source of the world's dominant consumption models and aspirations. To break with current conceptions and ensure that aspirations for *sustainable* prosperity become the global pattern, such aspirations first need to be widely and visibly embraced within developed countries.

It should also be pointed out that the recent UNEP and Consumers International review of implementation of the Sustainable Consumption section added to the United Nations Guidelines for Consumer Protection in 1999 found a "clear need for a better and more systematic approach to spreading knowledge and understanding of the Guidelines." ◆

For more information about UNEP's cleaner production activities, see www.uneptie.org/pc/cp.

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Presentación y contexto

Este número doble de *Industry and Environment* incluye información acerca del Séptimo Seminario Internacional sobre Producción más Limpia (PL7), que se realizó del 28 al 30 de abril de 2002 en Praga. El Seminario fue organizado por la UNEP y el Ministerio de Medio Ambiente de la República Checa y tuvo como anfitrión al gobierno checo.

Una de las conclusiones claves del PL7 fue que la aplicación conjunta de producción más limpia y consumo sustentable constituyen uno de los pilares principales del desarrollo sustentable. La UNEP ha estado trabajando para asegurar la integración adecuada de estos conceptos.

Hacia principios de 2002 se resaltó la importancia de integrar ambos conceptos. Como parte de las preparaciones para la Cumbre Mundial sobre Desarrollo Sustentable (World Summit on Sustainable Development – WSSD), la UNEP presentó informes de 22 sectores industriales sobre sus progresos en haras de la sustentabilidad y las iniciativas pendientes. Dentro de sus conclusiones el proyecto establece que los logros ambientales de la industria se ven neutralizados por el aumento del consumo.

Con anterioridad a la WSSD y el PL7, la UNEP editó informes sobre los progresos a la fecha en producción más limpia y consumo sustentables *(www.uneptie.org/pc/cp)*. A continuación se describen las propuestas y desafíos que destacan los informes.

Producción más limpia

Los progresos tangibles a nivel mundial en producción más limpias incluyen:

- Una red de más de 100 centros de producción más limpia, que operan en todas las regiones brindando asistencia técnica, entrenamiento e información, y otro tipo de servicios a nivel local y nacional;
- Organización de mesas redondas en Africa, región Asia Pacífico, Europa y las Américas para facilitar la difusión de información y el intercambio de experiencias entre y a través de las regiones;
- Más de 100 instituciones educativas que ofrecen cursos en producción más limpia, brindando educación a miles de estudiantes y profesionales del mercado laboral;
- Más de 1000 proyectos de prueba en varios países, que aportan pruebas fehacientes de la magnitud del alcance de la reducción de energía y materia prima en procesos de producción, con la consecuente reducción de residuos y polución;
- La instauración de mecanismos institucionales

Présentation et contexte

Ce numéro double d'*Industry and Environment* rend compte du 7e Séminaire international sur la production plus propre (CP7) qui s'est déroulé du 28 au 30 avril 2002 à Prague. Organisé par le PNUE et le ministère de l'Environnement de la république Tchèque, il était accueilli par le gouvernement tchèque.

Le séminaire a tout particulièrement insisté sur un point : la production plus propre et la consommation durable constituent à elles deux l'une des clefs de voûte du développement durable. Le PNUE œuvre pour que ces concepts soient correctement intégrés.

L'importance de la combinaison des deux concepts avait déjà été soulignée courant 2002 quand, dans le cadre de la préparation du Sommet mondial sur le développement durable, le PNUE avait donné à 22 secteurs industriels la possibilité de rendre compte de leurs progrès en matière de développement durable et du travail restant à faire. L'une des conclusions du projet est que si l'industrie a amélioré ses performances environnementales, ses avancées sont neutralisées par l'augmentation de la consommation.

Avant le Sommet mondial de Johannesburg et le séminaire CP7, le PNUE a également publié des états des lieux de la production plus propre et de la consommation durable (voir *www.uneptie.org/pc/cp*). Les avancées et les difficultés exposées dans ces rapports sont résumées ci-après.

Production plus propre

Les progrès tangibles accomplis dans le monde en matière de production plus propre sont notamment :

- un réseau de plus de 100 centres de production plus propre implantés dans toutes les régions pour fournir à l'échelon local et national des prestations d'assistance technique, de formation et d'informations, ainsi que d'autres services ;
- des tables rondes en Afrique, en Asie-Pacifique, en Europe et sur le continent américain qui ont facilité la diffusion des informations et les échanges d'expériences entre régions et à l'intérieur des régions ;
- plus de 100 établissements d'enseignement qui proposent des cours sur la production plus propre suivis par des milliers d'étudiants, ainsi que par des professionnels en activité ;
- plus de 1 000 projets de démonstration dans divers pays, preuve indéniable des possibilités extraordinaires qui s'offrent de réduire la consommation de matière et d'énergie dans les procédés de production, donc de diminuer les volumes de déchets et la pollution ;
- la mise en place de mécanismes institutionnels pour le transfert et l'adoption de technologies plus propres qui a permis à ces technologies de s'imposer davantage ;
- des programmes de financement de la production plus propre et l'assistance technique correspondante, qui ont permis la mise en œuvre par de nombreuses grandes entreprises de mesures de production plus propre et l'installation de technologies plus sûres et plus propres.

Il reste toutefois beaucoup à faire pour développer et intégrer davantage la production plus propre.

Voici quelques exemples de stratégies proposées :

- intégrer formellement la production plus propre et la consommation durable pour faciliter l'adoption d'une approche couvrant la totalité du cycle de vie des produits ou services, débordant ainsi les installations de production pour englober l'utilisation et l'élimination des produits ;
- intégrer la production plus propre dans les processus nationaux et locaux de planification du développement et dans les politiques cadres ;
- étendre le réseau de centres et d'organismes de production plus propre, élargir leurs rôles et accroître leurs capacités ;
- lier les questions connexes entre elles, comme l'application des accords multilatéraux sur l'environnement, l'efficacité énergétique, l'hygiène et la sécurité, les systèmes de gestion de l'environnement ;
- accroître la communication avec les petites et moyennes entreprises pour les aider à appliquer les mesures en faveur de la production plus propre ;
- encourager le secteur privé à participer davantage au développement des technologies et à la coopération dans ce domaine, au financement des investissements dans la production plus propre et à la création de marchés.

Consommation durable

Partout dans le monde, les modes de consommation restent une menace pour le développement durable. Les disparités croissantes dans les niveaux de consommation entre pays riches et pauvres, mais aussi dans les pays en développement, sont particulièrement préoccupantes, de même que le fait que la progression globale de la consommation de ressources (eau, denrées alimentaires et énergie, en particulier) dans les pays développés annule les gains d'efficacité permis par les technologies.

Les modes de consommation durables doivent progresser dans les pays industrialisés, qui sont à l'origine des modèles de consommation et des aspirations qui prévalent dans le monde. Pour en finir avec les conceptions actuelles et faire en sorte que les aspirations à une prospérité *durable* deviennent le modèle mondial, il faut d'abord que les pays développés adhèrent largement et concrètement à ces aspirations.

Il faut signaler également que l'étude récente par le PNUE et Consumers International de la mise en œuvre de la section relative à la consommation durable ajoutée en 1999 aux « Lignes directrices des Nations Unies pour la protection du consommateur » fait ressortir le « besoin évident d'une démarche plus adéquate et plus systématique pour faire connaître et comprendre les Lignes directrices. » ◆

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para la transferencia y adopción de tecnologías más limpias, aumentando la incorporación de dichas tecnologías;

- Programas de financiamiento de producción más limpia y asistencia técnica, permitiendo la aplicación de medidas de producción más limpia y la incorporación de tecnologías más seguras y más limpias en varias de las principales companías.

Sin embargo, queda mucho por hacer en materia de fortalecimiento e integración de la producción más limpia.

Se propone, entre otras, las siguientes estrategias:

- Promover la integración de producción más limpia y consumo sustentable para facilitar la incorporación de propuestas que abarquen todo el ciclo de vida de un producto o servicio, desde la planta de producción hasta la utilización y disposición del producto;
- "Incorporar" la producción más limpia en la elaboración de estrategias y el desarrollo de políticas locales y nacionales;
- Ampliar la red de centros e instituciones de producción más limpia y aumentar sus funciones y beneficios;
- Vincular con otras cuestiones relacionadas, tales como la implementación de acuerdos ambientales multilaterales, sistemas de eficiencia energética, salud y seguridad, y sistemas de gestión ambiental;
- Promover la incorporación y aplicación de medidas de producción más limpia en pequeñas y medianas empresas;
- Fomentar una mayor participación del sector privado en el desarrollo e intercambio de tecnologías, financiamiento de inversiones en producción más limpia, y constitución del mercado.

Consumo sustentable

Los patrones de consumo globales aún constituyen una amenaza para el desarrollo sustentable. Se debe prestar especial atención a la disparidad creciente entre los niveles de consumo de países pobres y ricos y entre los niveles de consumo dentro de los países en vías de desarrollo. Asimismo es importante tener en cuenta que el aumento significativo del uso de recursos en países desarrollados (en particular agua, alimento y energía) se contrapone al aumento de eficiencia producto de la tecnología.

El progreso hacia el consumo sustentable se debe iniciar en países industrializados, donde se generan los modelos de consumo que prevalecen a nivel mundial. Para contrarrestar las concepciones actuales y constituir patrones globales que incorporen metas de prosperidad *sustentable*, los países desarrollados deben incorporar antes dichas metas de manera clara y manifiesta.

Cabe señalar que el informe elaborado recientemente por UNEP y Consumidores Internacionales acerca de la aplicación de la sección de Consumo Sustentable anexado a la Guía de Protección del Consumidor de la Naciones Unidas en 1999, establece "que se necesitan propuestas mejores y más sistemáticas para aumentar la difusión y comprensión de los contenidos de la Guía". ◆

Glossary

Sustainable production and consumption: some frequently used terms

Cleaner production: the continuous application of an integrated preventive environmental strategy to processes, products and services to increase overall efficiency, and to reduce risks to humans and the environment. Cleaner production can be applied to the processes used in any industry, to products themselves, and to various services provided in society (UNEP).

Eco-efficiency: the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while they progressively reduce ecological impacts and resource intensity throughout the life cycle to a level at least in line with the Earth's estimated carrying capacity (World Business Council for Sustainable Development, WBCSD). Eco-efficiency is based on issues of economic efficiency that will produce environmental benefits, while cleaner production starts from issues of environmental efficiency that will produce economic benefits.

Factor 4/factor 10: the concept that, in order for sustainability to be reached and maintained during a period when human populations are likely to double in size and average living standards to increase significantly, industry should increase its resource conversion efficiency by a minimum factor of 4 (i.e. resource productivity should grow fourfold). Put another way, the amount of wealth extracted from one natural resource unit should be quadrupled. Since industrialized societies typically consume 20 to 30 times more than less developed ones, some people are calling for a factor 10 increase in conversion efficiency in the developed world (Rocky Mountain Institute and Wuppertal Institute).

Green productivity: a strategy for enhancing productivity and environmental performance with a view to overall socio-economic development, involving the use of appropriate techniques, technologies and management systems to produce environmentally compatible goods and services. Green productivity can be applied to manufacturing, services, agriculture and the community (Asian Productivity Organization, APO).

Leapfrogging: process by which, through technology transfer, developing countries adopt technologies designed and tested in industrialized countries without bearing the costs of development or experiencing the same relatively slow stages of development that characterized the introduction of these technologies in the industrialized world (various sources).

Life-cycle approaches: ways to address environmental issues and opportunities holistically, and to evaluate or design product service systems with the goal of reducing potential environmental impacts over the entire life cycle. These approaches include:

- **Life-cycle assessment:** an objective process for evaluating the environmental burdens associated with a product, process or activity by identifying the energy and materials used and wastes released to the environment, and to evaluate and implement opportunities to effect environmental improvements (Society of Environmental Toxicology and Chemistry, SETAC).

- **Life-cycle management:** an integrated framework of concepts, techniques and procedures to address environmental, economic, technological and social aspects of products and organizations, in order to achieve continuous environmental improvement from a life-cycle perspective (SETAC).

- **Design for environment:** (also called "eco-design"): systematic integration of environmental and social considerations into product and process design (National Research Council of Canada).

- **Product service systems:** a marketable mix of products and services that jointly fulfil client needs with less environmental impact (UNEP).

- **Integrated product policy:** working to stimulate each part of each phase of a product or service life cycle to improve its environmental performance, from natural resources extraction through design, manufacture, assembly, marketing, distribution, sale and use, and on to eventual disposal as waste (EU).

Pollution prevention: the use of processes, practices, materials, products or energy that avoid or minimize the creation of pollutants and waste, and that reduce the overall risk to human health or the environment (Environment Canada). Pollution prevention and cleaner production both focus on a strategy of continuously reducing pollution and environmental impacts through reduction at source.

Rebound effect (also called "take-back effect" or "offsetting behaviour"): increased consumption resulting from actions that increase efficiency and reduce consumer costs. One example would be a home insulation programme that reduces heat losses by 50% but does not succeed in bringing about a 50% reduction in energy consumption, as residents discover they can now afford to keep their homes warmer more cheaply. In such cases a portion of potential energy savings is spent on greater comfort (Online TDM Encyclopedia, *www.vtpi.org/tdm*).

Sustainable consumption: consumption of services and products that respond to basic needs and bring a better quality of life, while minimizing use of natural resources and toxic materials as well as the generation of wastes and pollutants over the whole life cycle of the product or service, so as not to jeopardize the needs of future generations (UN Commission on Sustainable Development, UNCSD).

Triple bottom line: the whole set of values, issues and processes companies must address in order to minimize the harm resulting from their activities and to create economic, social and environmental value. The three bottom lines represent society, the economy and the environment. Society depends on the economy – and the economy depends on the global ecosystem, whose health is the ultimate bottom line (SustainAbility).

Sources of definitions indicated in brackets. ◆

Recommendations

Seventh International High-level Seminar on Cleaner Production
28-30 April 2002, Prague, Czech Republic

The following recommendations were adopted in Prague. They were drawn from conclusions presented at the end of each plenary session.

1. Further strengthen government policies and continue strategies to build institutions for mainstreaming cleaner production.
Put particular emphasis on enhancing the institutional, technical and managerial capacity of the National Cleaner Production Centres, as well as expanding the NCPC network.

2. Expand the scope of cleaner production to address sustainable consumption, with particular attention to the rebound effects of unsustainable consumption.
Integrate the expanded definition of cleaner production into sustainable consumption thinking. The UNEP/SETAC Life Cycle Initiative, launched in Prague, should provide an opportunity to communicate the expanded definition.

3. Continue development of policies, planning and strategies oriented towards cleaner production.
Set up economic and political frameworks, at the national, regional and international levels, that are conducive to adoption of cleaner production. Promote the International Declaration on Cleaner Production and obtain further commitments. Mainstream cleaner production in environmental governance and national economic development policies and programmes.

4. Develop synergy between cleaner production and multilateral environmental agreements.
Define the needs of various MEAs with respect to cleaner production, as well as links between cleaner production and the agreements. Cleaner Production Centres should be supported further so that they play an expanded role in establishing such links and building dialogue. Clearinghouses and centres for excellence, oriented towards technology development and transfer related to MEAs, should be made part of NCPC activities.

5. Promote cleaner production in investments and obtain the commitment of the private financial sector.
Encourage funding of cleaner production through local financing institutions as well as multilateral development banks. Raise the local institutions' capacity and strengthen funding mechanisms, and better target small and medium-sized enterprises (SMEs) and local governments.

6. Promote application of cleaner production in sectors such as services and infrastructure, using complementary approaches including energy efficiency, safer production and resource protection.
Expand the base of cleaner production stakeholders to include consumer-related organizations, the media and market players such as retailers, vendors and suppliers.

7. Increase trade links and business-to-business interactions through networks such as the Sustainable Alternative Network (SANet), initiated by UNEP and the Global Environment Facility.
While continuing to promote technology transfer from industrialized/developed countries, recognize the potential of local technology development.

8. Increase demand for cleaner production-related information by moving beyond information networking to knowledge management and counseling.
Improve the context, relevance and user-friendliness of cleaner production information systems vis-à-vis developing countries. Strengthen the NCPCs' capacity for effective information delivery.

9. Promote innovative partnerships, focusing on those involving the private sector.
Include partnerships with international and national bodies, between business and civil society and between business and government.

10. Emphasize and integrate workplace-related health and safety issues, gender issues and labour rights in the application of cleaner production.

11. Continue efforts to promote cleaner production to SMEs.
Focus on SMEs through approaches such as supply-chain management involving trade, contracting, information and technology transfer.

12. Continue efforts towards capacity building in cleaner production.
Follow the CPC/NCPC approach and use "train the trainer" strategies to build cleaner production capacity on the part of other professionals and to develop a market for cleaner production.

All participants agreed that these recommendations should constitute input to the World Summit on Sustainable Development in Johannesburg. ◆

Keynote Speeches

Isabelita Sy-Palanca

Chair, National Steering Committee on the Global Compact, Philippines

One of the challenges associated with sustainable development in Asia is reaching small and medium-sized enterprises (SMEs), many of which are family-run and have between ten and 100 employees. In her keynote address Mrs. Palanca focused on how to reach this group effectively. SMEs supply goods and services to local markets and larger corporations; they often play vital economic and social roles in the local community. However, recognition of SMEs is limited on the international scale. They are essentially "faceless".

Mrs. Palanca noted that in view of this "facelessness" internationally it would be difficult to implement cleaner production directly in Asian SMEs. Understanding of cleaner production operations is limited, and penalties for violations would be difficult to enforce. While cleaner production, the drive for decent work conditions, the Global Compact and many other UN activities are worthwhile, most SMEs would be reluctant to incorporate such agendas since they assume that this would increase the expense of running their business. Disenfranchisement of SMEs occurs regularly. Grievances are not often addressed or even recognized, due to the fact that larger international companies and their networks are for the most part unaware of their presence. Furthermore, SMEs are predominantly operated by women. The CEO is often a woman who has started – or taken over – a family business.

By contrast, large multinational companies competing in the global market have thousands of employees and well-trained management. They can be better partners for initiating and implementing widespread change. Large corporations frequently have self-sufficient facilities providing a full range of on-site services. They are ISO certified and their work ethics, systems and procedures comply with "best practice" standards.

A disproportionate majority of businesses in Asia are SMEs faced with competition from other markets that readily provide cheaper goods. Thus SMEs are primarily concerned with immediate fiscal responsibilities, and initiatives such as cleaner production are relegated to an inferior position. It is more realistic for bigger businesses to implement such initiatives and, through them, to affect changes in SMEs.

To address the challenge, Mrs. Palanca welcomed the Global Compact as very timely in that it recognizes the need for private business to become involved in sustainable development and to comply with the nine principles of the Global Compact, which relate to human rights, labour rights and the environment.

Mrs. Palanca chairs three committees of the Employers' Federation of the Philippines related to social responsibility, the Global Compact and the Federation's annual convention. She described how these committees are reaching out to involve SMEs in the Global Compact through such initiatives as:

- "speaking the language of business" through presenting the Global Compact as a call to share the benefits of the New Global Economy. The outreach messages cite cases in which suppliers have been banned or ostracized because of their non-adherence to protection of human rights, labour rights or the environment;
- "synergizing limited resources" by using the Global Compact as the theme of the employer federation's national annual convention and fostering adherence to the Global Compact through preparatory regional consultations leading up to the national convention;
- "facilitating the establishment of business-initiated, multi-sectoral committees designed to foster consensus-building" among employers, employees, NGOs, the media, academia, churches and local government units. The committees have been organized through partnerships with large corporations, as well as organizations with chapters throughout the Philippines and with many SME members – chambers of commerce, industry associations and the Women's Business Council of the Philippines. This strategy is based on using the synergy of partners;
- capitalizing on the aspirational nature of the Global Compact principles to appeal for broad-based support. There are plans for a media campaign and endorsement by popular personalities. Strategic plans include monitoring schemes, documentation processes and systems, and incentives for compliance. The support of Gloria Macapagal Arroyo, President of the Philippines, is being sought.

Mrs. Palanca linked the Global Compact and cleaner production to the goals of the organizations she works with: to help women and SMEs enter the world of global business and, by being there, to transform the human face of globalization into a happy one. ◆

The Life Cycle Initiative

Lorraine Maltby

President, World Council of the Society of Environmental Toxicology and Chemistry (SETAC), Belgium

The launch of the Life Cycle Initiative began with a keynote address by Lorraine Maltby, President of the SETAC World Council, Belgium. SETAC is a not-for-profit professional society founded in North America in 1979, with over 5000 members in more than 70 countries and a mission to support the development of principles and practices for the protection, enhancement and management of sustainable environmental quality and ecosystem integrity. Life-cycle assessment and management, Ms. Maltby emphasized, are key elements in achieving this mission.

The Life Cycle Initiative created in May 2000 between SETAC and UNEP brings to this initiative a global, scientific approach to environmental issues by drawing on SETAC members from government, industry and academia in both developed and developing nations. This complements UNEP's work on environmental policy issues and interactions with governments. The objective of the Life Cycle Initiative is to influence scientists, managers and policy-makers to look at environmental issues in a more holistic and integrated manner.

Ms. Maltby described three key challenges and the Life Cycle Initiative programmes set up to address them:

- a Life Cycle Inventory (LCI) Programme to address the lack of standard life-cycle data and the limited access to such information;
- a Life Cycle Impact Assessment (LCIA) Programme to address the lack of universally agreed assessment practices;
- a Life Cycle Management (LCM) Programme to address the limited understanding of importance and value when assessing impacts, trade-offs and opportunities during a product's life cycle.

These three working groups will be managed by the International Life Cycle Panel (ILCP), chaired by UNEP's Assistant Executive Director, Jacqueline Aloisi de Larderel. The Panel is co-chaired by the official SETAC representative, James Fava of Five Winds International (United States) and Atsushi Inaba of the Japanese National Institute of Advanced Industrial Science and Technology.

The aim of the Life Cycle Initiative is to provide practitioners with the tools required to implement a life-cycle approach rather than to satisfy the needs of the academic community. To this end, the Initiative will:

- develop demonstration projects and guidelines related to LCA and life-cycle thinking. These can be adapted to different sectors and regions and used to promote better environmental management;
- develop training modules and dissemination activities to educate and to foster life-cycle thinking;
- develop indicators on environmental, economic and social issues;
- develop communication strategies and a global network of interested parties.

Ms. Maltby talked about LCI activities in 2001-2002, which included meetings, workshops, short courses and publications.

Further information is available on the Life Cycle Initiative web site hosted by UNEP (www.uneptie.org/pc/sustain /lca/lca. htm) and the SETAC web site (www.setac.org).

UNEP's 7th International High-level Seminar on Cleaner Production
Prague, Czech Republic, April 29-30, 2002
Prague
UNEP
Klaus TOEPFER
Lorraine MALTBY

Summary Report

In this Summary Report the presentations and discussions at UNEP's Seventh International High-level Seminar on Cleaner Production (CP7) in April 2002 are summarized. Each of the plenary sessions is briefly described. Highlights of the parallel sessions are also presented.

The articles on cleaner production that follow this Summary Report are based on papers submitted before and after the seminar.

Opening ceremony

Czech Environment Minister Milos Kuzvart and UNEP Executive Director Klaus Toepfer welcomed the over 350 delegates to Prague. A ceremony launching the UNEP/SETAC Life Cycle Initiative then took place, with a keynote address by Lorraine Maltby, president of the Brussels-based World Council of the Society of Environmental Toxicology and Chemistry (SETAC).

Mr. Kuzvart described the seminar as setting the stage for the World Summit on Sustainable Development (WSSD). He highlighted some of the Czech Republic's actions related to sustainability, such as national programmes on eco-labelling, cleaner production and EMAS (the EU Eco-Management and Audit Scheme) as well as guidelines for voluntary agreements and a methodology for life-cycle assessment. The Czech government has issued a recommendation that ministries choose environmentally friendly products. Every year it evaluates how well they have followed through. Mr. Kuzvart emphasized the roles of information, training and public education in fostering sustainable consumption and production.

> We must think of the end of the life cycle before we create products
>
> **Klaus Toepfer, UNEP**

Mr. Toepfer's speech echoed the sentiment that the seminar was about getting ready for WSSD, especially with respect to ways the participants and their institutions could act to change production and consumption patterns. At the 1992 Earth Summit people were so sure cleaner production would succeed that they neglected implementation and did not do a good enough job of explaining the concept to governments, industry and the public. In contrast, WSSD must be followed up by education and action.

The rate of growth of both population and consumption in lower-income countries makes the emphasis on sustainable consumption especially urgent. "We must think of the end of the life cycle before we create products. Such thinking will lead to new kinds of products," Mr Toepfer said. This would entail more efficient use of resources and less environmental burden.

The aim of the Life Cycle Initiative being launched by UNEP and SETAC is to help government, businesses and consumers adopt more environmentally friendly policies, practices and lifestyles. Mr Toepfer stressed that active collaboration by private enterprise will be necessary if life-cycle thinking and acting are to become a reality.

Ms. Maltby, in her keynote speech, introduced SETAC to participants and described the initiative's origins and operations (see page 10).

Plenary Sessions

From Rio to Johannesburg, and the next ten years

The speakers at the first plenary session were again Mr. Kuzvart and Mr. Toepfer. UNEP's Executive Director emphasized the role of partnerships (between governments, between government and business, and between government and consumers) in achieving sustainable production and consumption.

Much has been achieved since Rio in relation to the implementation of Agenda 21, he said. Citing growth in public awareness, institutions and conventions, both internationally and regionally, Mr. Toepfer underlined the importance of UN Secretary-General Kofi Annan's Global Compact, with its nine principles concerning human rights, labour standards and the environment. Implementation of the Global Compact is being facilitated by UNEP, along with the International Labour Organisation (ILO) and the UN Commission on Human Rights.

Isabelita Sy Palanca

Society must move from addressing the "limits of growth" to the "growth of limits". That is, human possibilities need to be expanded through an efficiency revolution. A "factor 4" increase in efficiency of resource use will not be enough, Mr. Toepfer argued. Ultimately we must increase efficiency by a factor of 10.

Eradicating poverty and achieving sustainable development continue to be the main goals of the global community. The former depends on investment in new jobs, especially for young people in developing countries; the latter means changing production and consumption patterns.

Meeting that challenge will require measures and initiatives such as:

◆ integrating environmental costs into prices – not to "punish" users but to stimulate technology development;

◆ managing growth in demand for water, partly through cleaner production as applied to water use by industry;

◆ cooperating with private business;

u integrating financial institutions into the process of change;

◆ using eco-labelling to inform consumers about the life cycle of products they buy;

◆ initiating take-back programmes for cars and other products (Mr. Toepfer noted the European Union's advances in this area and in the area of eco-labelling);

◆ working with the media to help change consumption patterns;

◆ involving young people.

Mr. Toepfer briefly sketched the history of cleaner production, noting that UNEP had done much to promote the concept and get it recognized globally. It was launched in 1989 at the First High-level Seminar on Cleaner Production, hosted by the UK. That event led to the establishment of National Cleaner Production Centres (NCPCs) jointly backed by UNEP and the United Nations Industrial Development Organization (UNIDO). Biennial seminars have since been hosted by France, Poland, the UK again, Korea, Canada and now the Czech Republic. Among UNEP's other initiatives are its publications on cleaner production, the 1998 International Declaration on Cleaner Production, and support for starting the Regional Round Tables on Cleaner Production. UNEP has worked with the Asian Development Bank and several other regional and world organizations to catalyse the adoption of cleaner production or similar programmes. (See www/uneptie.org/pc/pc for more about UNEP's cleaner production activities.)

Christian Kornevall

The introductory addresses were followed by keynote speeches by Christian Kornevall (Senior Vice President and Head of Sustainability Affairs at ABB Brown Boveri, Switzerland) and Isabelita Sy Palanca (Vice-Chair of the Women's Business Council, Philippines, and Chair-elect of the Confederation of Women Business Councils in APEC) (see page 10).

◆

Parallel session : Government perspectives

Chair: Martina Motlova (Deputy Minister-Director General, Ministry of the Environment, Czech Republic). Introduction: Janine Ferretti (Executive Director, North American Commission for Environmental Cooperation, Canada). Panellists: Dagmar Sucharovova (Deputy Director, Environmental Strategy, Ministry of the Environment, Czech Republic), Sirithan Pairoj-Boriboon (Director General, Pollution Control Department, Thailand) and Yin Gai (Director General, Department of Science, Technology and Standards, SEPA, China).

Panellists discussed government policies and strategies to promote sustainable production and consumption and cited specific government initiatives. They concluded that:

For government policies and strategies to be "mainstreamed", governments need to i) modernise their regulatory efforts while continuing existing awareness-raising and challenges to industry; ii) integrate their policies, programmes and tools; iii) look for new ways to integrate pollution prevention/cleaner production initiatives into industrial, fiscal and investment policies and decisions.

In many countries, promotion of voluntary agreements has proved a good basis for development of negotiations between the government

Changing production and consumption patterns: progress made and remaining challenges

The second plenary session opened with remarks by Jacqueline Aloisi de Larderel (UNEP Assistant Executive Director and Director, Division of Technology, Industry and Economics) and Surya Chandak (Cleaner Production Coordinator, UNEP DTIE), followed by panellists' presentations.

Chairing the session, Mrs. Aloisi de Larderel reviewed progress in cleaner production since 1989. She described cleaner production and sustainable consumption as complementary means of reaching the goal of sustainable development, and stressed the need for factor 4 and, ultimately, factor 10 improvements in resource use and pollution prevention. UNEP has developed various approaches to promote cleaner production and sustainable consumption, shown in the table below with the accompanying tools and techniques.

The 22 industry sector reports produced by UNEP and industry associations in preparation for WSSD – the first such sectoral reporting ever carried out – demonstrate that industry has certainly made environmental improvements, but Mrs. Aloisi de Larderel added that these improvements are neutralized as consumption grows. Nor, she noted, do the reports cover the environmental impact of smaller businesses.

Referring to the common belief that protecting the environment is costly, she said the key message to be disseminated is that prevention makes good business sense. Preventive approaches yield three types of dividend: environmental, economic and social. In addition, the preventive approaches embodied in cleaner production can significantly enhance implementation of multilateral environmental agreements (MEAs). Mrs. Aloisi de Larderel underlined that energy efficiency considerations should be part of cleaner production.

Cleaner production and sustainable consumption are two sides of the same coin. We need demand for cleaner products, and we need supply of such products

Jacqueline Aloisi de Larderel, UNEP

Approach	Tools/techniques
Integration of issues	◆ Cleaner and safer production ◆ Cleaner production and eco-efficiency integration ◆ Cleaner production and environmental convention integration ◆ Life-cycle approaches
Cleaner production in development planning	◆ International Declaration on Cleaner Production to secure commitment ◆ Policy frameworks conducive to cleaner production
Communication and information networking	◆ Efficient Entrepreneur calendar ◆ Publications and databases ◆ Dissemination via the media (e.g. UNEP Advertising and Communication Initiative)
Partnerships and capacity building	◆ Sustainable Alternatives Network (SANet) ◆ NCPCs ◆ Cleaner production in educational curricula
Technology development and finance	◆ UNEP Finance Initiatives ◆ Environmental technology assessment ◆ Financing Cleaner Production

To set the discussions at this seminar in context, she presented global and regional trends drawn from *Tomorrow's Markets: Global Trends and Their Implications for Business*, a joint publication of the World Resources Institute, UNEP and the World Business Council for Sustainable Development:

- Population growth in developing regions will mean large markets dominated by the young.
- As economies become more service-based, women's role in the formal labour force is growing.
- Rising consumption and energy demand, and continuing pollution, accelerate the need for innovation that produces more value with less environmental impact.
- Survival depends on preserving natural capital – the resource base.
- Business will be conducted in an increasingly networked world.
- The spread of democracy improves conditions for market-based economies, but also increases demand for greater accountability from government and business; business must earn the licence to operate.

In this context, important challenges facing UNEP and cleaner production advocates and practitioners are to:

- go beyond production processes and introduce life-cycle thinking, which includes addressing consumption patterns. Cleaner production and sustainable consumption are two sides of the same coin. We need demand for cleaner products, and we need supply of such products;
- forge new partnerships and invigorate existing ones;
- put cleaner production and sustainable consumption on the agenda of trade organizations. Leverage increased financing for application of cleaner production (e.g. through the Finance Initiatives and Financing Cleaner Production);
- improve availability of information to agents of change (e.g. through the Internet-based Sustainable Alternatives Network, or SANet);
- provide learning forums, such as CP7.

Mr. Chandak began by observing that while the

and stakeholder groups. A combination of voluntary initiatives and introduction of mandatory programmes would seem an acceptable way to speed the adoption of cleaner production and sustainable consumption.

Governments should institute "smarter" regulations. Environmental regulations should focus much more on products than on processes.

The emphasis on products should be accompanied by a life-cycle perspective. One way regulations can combine effective solutions to environmental problems with enhanced productivity is by stimulating innovation.

Governments at all levels should formulate and implement effective policy packages. Some countries have come up with very effective provincial and local initiatives and strategies in promoting cleaner production and sustainable consumption. Initiatives in three countries were cited:

- The Czech Republic: voluntary agreements between the Ministry of the Environment and various associations (industry, services);
- China: construction of ecological industrial parks at the regional level and establishment of cleaner production centres at provincial and local levels;
- Thailand: an effort to raise public awareness of government initiatives so that the government is seen not only as a regulator but also as encouraging partnerships with stakeholders.

idea of sustainable development was as old as the Hindu scriptures, in modern times the concept was presented in the 1987 report *Our Common Future*. The challenge is to put the concept into practice. By 1992 cleaner production had been recognized as an important part of meeting that challenge. Since then over 500 workshops on the subject have reached thousands of people. Organizations such as the World Bank and Asian Development Bank, as well as many industries, now recognize the language of cleaner production.

Some question whether cleaner production actually works, but Mr. Chandak pointed to evidence from more than 1000 industry-based demonstration projects proving that the concept makes good business sense. Applying cleaner production, however, requires support. To this end, NCPCs around the world have been building capacity at national and local levels.

Surya Chandak

The issue now is engaging stakeholders, which the NCPCs alone cannot do. Additional initiatives to help engage stakeholders and move implementation forward include:

- 70 courses on cleaner production at universities;
- 111 institutions providing information on cleaner production;
- technology transfer networks;
- efforts to develop financing mechanisms;
- projects to "mainstream" cleaner production into policy development frameworks in certain countries of Africa and Asia.

"But the more that's achieved," Mr. Chandak continued, "the more we see that needs to be done." He highlighted four issues in particular:

- integration of cleaner production and sustainable consumption into a holistic approach to sustainable development;
- moving more effectively from "signature to

Parallel session: Industry perspectives

Chair: Roland Vaxelaire (CEO, Delegate Carrefour Group to the EU, Carrefour, Belgium). Introduction: Mohiuddin Babar (Communications Manager, Lafarge Cement, Bangladesh). Panellists: Julie Haines (Chief of Party, US-Asia Environmental Partnership , United States), Otakar Kaucky (Managing Director, Kovohutě Příbram, Czech Republic), Winfried Hoelzer (Director of Environment, L'Oréal, France) and Andreas Kircherer (BASF Aktiengesellschaft, Germany).

The session focused on industry initiatives and experiences in promoting sustainable production and consumption.

Mr. Vaxelaire related sustainable development to his company's sense of responsibility to customers, employees, suppliers and shareholders. Carrefour is active in all types of retail distribution, primarily food retailing, with stores in 30 countries. The company sees its responsibility to customers as supplying safe, good-quality products at low prices; to employees, not only providing a fair salary but also addressing training and social needs; to shareholders, making a profit. An aspect of the company's social responsibility is the US$ 585 million in taxes it pays to the communities it operates in.

Mr. Babar focused on the special challenges developing countries face in promoting cleaner production and sustainable consumption. Environmental degradation is an issue around the world, but has more severe impacts in developing countries. For example, climate change could leave Bangladesh flooded. Furthermore, while multinationals operating in the developing world may use cleaner practices, local SMEs cannot or will not. Mr. Babar stressed the effects of developing-world population growth on agriculture and industry, and observed that consumption patterns imported from the developed world have a significant impact on lifestyles and the environment in developing countries.

Despite increasing understanding of sustainable development in developing countries, these countries lag behind the developed world in framing policies and implementing action plans. To bring about the right conditions for industry to promote sustainability, governments must prioritise local and regional action programmes, emphasise cost-effective approaches to pollution and waste treatment, and introduce market-based economic instruments. Mr. Babar called on developing-country governments to work in close partnership with NGOs that have good connections with the grassroots. Cleaner production is a fundamental component of good enterprise management, but requires government, business and other stakeholders to work together.

Ultimately the market will drive industrial behaviour

Julie Haines, US-Asia Environmental Partnership

He concluded with two questions: How can greener production be better integrated into business systems? And how can people on the front lines be made more aware of and committed to sustainable development and production?

Ms. Haines said members of her major architectural and engineering firm had long grappled with how to motivate companies in developing countries. Their conclusion: "We can talk until we're blue in the face, but ultimately the market will drive industrial behaviour." She added that: "As cleaner production people we've been very poor at capturing what motivates people. Much of the answer has to do with data collection and putting the case for sustainable development in concrete business language."

Mr. Kaucky, whose medium-sized company focuses on recycling of lead and other metals, described how Kovohutě Příbram's recently modernized lead plant had incorporated sustainable production. Mining and metallurgy in Příbram date back to at least 1311, and a plant completed in 1793 was the basis of the present company. Technology modernization and the construction of a new furnace in the 1990s brought the plant up to contemporary European standards.

The firm's recycling activities focus on lead and lead alloy waste and lead accumulators, the final product being lead and lead alloys in ingots. The precious metals division recycles electronic and electro-technical devices in an environmentally sound manner. Numerous smaller companies disassemble, sort and partially process the electronic waste, after which Kovohutě Příbram extracts gold, silver, palladium and platinum using traditional lead technology. The product division makes and sells a broad assortment of items based on lead, tin, antimony and other non-ferrous metals.

Several projects are under way at Kovohutě Příbram to develop technology for cleaner processing and recycling of metals. The company's future success, Mr. Kaucky added, depends on addressing environmental and human health issues as much as economic ones.

Mr. Hoelzer said the cosmetic industry produces relatively little pollution and takes the environment very seriously. As the world's largest cosmetic company, L'Oréal has a leadership role on environmental issues in the industry. Middle management had undertaken many environmental initiatives, but not until a commitment came from the CEO did significant change happen. At each plant owned by L'Oréal and its subsidiaries, someone is assigned specific

The more that's achieved, the more we see that needs to be done

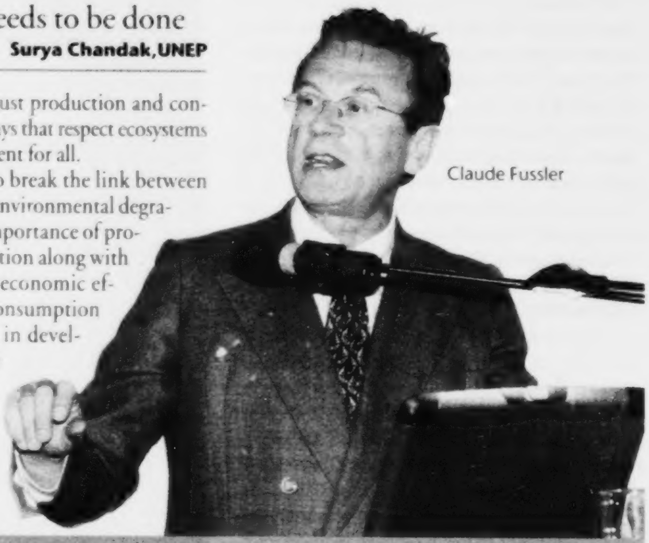
Surya Chandak, UNEP

action" on the International Declaration on Cleaner Production;

- integration of cleaner production into policy making and decision making to facilitate its application;
- integrating cleaner production with MEAs to facilitate implementation of the latter.

Opening the panellist presentations, Victor Escobar Paredes (Head of Unit, Institutional Cooperation Section, Ministry of the Environment, Spain) noted that in today's global markets most problems with unsustainable consumption and production patterns stem from developed countries, while the social and environmental effects are largely felt in developing countries. He called for efforts to adjust production and consumption patterns in ways that respect ecosystems and facilitate development for all.

Stressing the need to break the link between economic growth and environmental degradation, he noted the importance of promoting cleaner production along with new technologies and economic efficiency. A change in consumption patterns and lifestyles in developed countries will be crucial, but if such change is well managed it will not threaten jobs or quality of life.



Claude Fussler

responsibility for the environment, and all the plants are expected to meet the same standards worldwide. A system of awards helps engage employees in environmental issues. L'Oréal has a significant positive influence on other companies; as a market leader, it is often benchmarked. With its market clout it can require environmentally friendly behaviour from its suppliers, for example obliging them to eliminate heavy metals from packaging. Such pressure can generate new, greener technology.

Mr. Hoelzer emphasized that action, not words, wins consumers over. L'Oréal has banned the use of heavy metals and pesticides throughout its products' life cycles. "The alternatives cost a little more, but consumers will pay more, because they like our product." L'Oréal does not advertise such actions, however, because research indicates that "if you tell it, people will say it's just PR". Stories about a company's environmental actions have much more credibility when told by third parties. He added that to reach young people one must speak their language and use their media, such as video games.

"Because we are really caring," he concluded, "we are successful. Doing a very good business and environmental responsibility are not mutually exclusive."

Here Mr. Vaxelaire, the chair, underlined four factors in L'Oréal's experience: CEO and other management commitment, an employee reward system, serving as the benchmark for other companies, and emphasizing actions over words.

Mr. Kircherer described the sustainable development "platform" that BASF, a company with annual sales of $35 billion, initiated several years ago. The platform rests on the three pillars of sustainability: economic, environmental and social. Commitment by the CEO is indeed critical, but the top-down approach is not enough; the strategy must include sales and marketing people, who will be best convinced if the company can show how standards and procedures not only address environmental issues but also improve the bottom line. For example, salespeople have a stake in pleasing the customer, so if the customer has environmental demands salespeople will try to meet them.

When BASF has success stories, it shares them with customers. The company has developed an "on-screen manager" to help customers address environmental, health and safety issues. It is also involved in a project with UNIDO and UNEP to help the US textile and dyeing industry address environmental issues.

Good business and environmental responsibility go hand in hand

Winfried Hoelzer, L'Oréal

Ms. Haines said she was "very heartened" by the excellent environmental programmes of some multinationals. She felt that cleaner production professionals should be sharing these stories with businesses, particularly SMEs, in the countries where they operate. "We ought to be talking about tools and outcomes, and doing so in language that can motivate business." The Global Reporting Initiative should be used to track progress in cleaner production and sustainable development because "what gets measured gets done." As such efforts involve more and more industries and customers, the pressure for use of cleaner production will build.

Mr. Vaxelaire said cleaner production people should pay more attention to the media, given its role in motivating people. He referred to the "lip service issue," i.e. consumers say they want green products and services but in fact tend to buy whatever is cheapest. There may be a role for multinationals in educating consumers. As for the challenge of promoting cleaner production to SMEs, they should be given affordable access to pollution prevention technology.

Delegate questions and comments

- Given the toxicity of lead, mercury and arsenic, we should be looking for alternative approaches to isolating precious metals.
- From a delegate involved in a union representing workers at Kovohutě Příbram, L'Oréal and BASF: How are companies involving the workforce in cleaner production? Workers can further cleaner production on the job and practise sustainable consumption off the job, and they are ambassadors for the values of a company. Companies should seize the opportunity to educate and train workers in cleaner production.
- It is important for upstream companies to train their customers in cleaner production. There are also opportunities to partner with NGOs in introducing cleaner production to industry.
- International retailers operating in developing countries do not give environmental concerns a high profile in their activities and communications; these retailers tend to overshadow local "mom and pop" stores.

The panellists strongly agreed that involving workers in cleaner production is important. Mr. Kircherer said BASF communicates with workers about environmental issues very often and in many different ways, such as the monthly article on eco-efficiency in the company newsletter. Mr. Hoelzer noted that people were reluctant to change work processes, so L'Oréal emphasizes worker training, particularly when change is involved. Mr. Vaxelaire said Carrefour is "conscious of not doing everything we have to regarding environmental issues and needing to go further with more initiatives."

Developing countries need opportunities to "leapfrog" directly from traditional production to cleaner production and environmentally sustainable growth, he said, calling for a global programme, led by developed countries, to promote cleaner production, reverse environmental degradation, support more equitable access to natural resources and further develop a common set of sustainable development indicators. He also reviewed EU proposals for actions to help achieve sustainable development (see page 22). "All this work will be meaningless if the social issues are not addressed."

Claude Fussler (Director, WSSD Preparations, World Business Council for Sustainable Development, Switzerland) showed participants a satellite photograph of Earth's night side, with concentrations of light dramatically illustrating the difference between energy use in the North and that in the South.

Light bulbs, he pointed out, are a product area where significant strides have been made in energy efficiency and in the amount of information and choice available to consumers. But the right market framework for fostering sustainable consumption requires additional elements:

- sustainable convergence criteria;
- shared targets and performance assessment processes involving governments, companies, communities, even households;
- negotiated transitions;
- removal of perverse subsidies;
- economic instruments to steer change;
- research and technology strategy;
- "walking the talk" (see book review, page 105).

Victor Escobar Paredes

Reg Green (Director, Health, Safety and Environmental Affairs, International Federation of Chemical, Energy, Mine and General Workers' Unions, Belgium) identified the need to bring the discussion of cleaner production and sustainable consumption down to a more human level. One of the best places to do that, he said, is the workplace. Workers are both producers and consumers. Associating cleaner production and sustainable consumption in the workplace through training and education will therefore be positive in sustainability terms.

> All this work will be meaningless if the social issues are not addressed
>
> **Victor Escobar Paredes, Ministry of Environment, Spain**

Rajeswari Kanniah and Reg Green

However, workers will even object to positive change if it means losing their jobs, livelihoods and self-respect. For workers in "sunset" industries, action is needed to minimize dislocations. The concept of a "just transition" from less sustainable to more sustainable patterns is increasingly seen as central to any strategy for making the necessary changes.

Rajeswari Kanniah (Assistant Director, Regional Office for Asia and the Pacific, Consumers International, Malaysia) observed that in Austria, Germany, Japan, the Netherlands and the United States total waste generation has been increasing despite eco-efficiency initiatives. Not enough has been done to clean up production, and life-cycle thinking has not been sufficiently integrated into cleaner production.

Multinational or transnational corporations (TNCs) are "largely a rule unto themselves" in the global economy. They are much larger and more powerful than the governments of many developing countries. Most pollution stems from TNC activities, environmental regulations have been relaxed in developing countries for competitive reasons, and hazardous waste is exported to developing countries. Such countries lack fair access to cleaner technologies, while the policies of TNCs and the International Monetary Fund are "biased against developing countries."

Since little progress has been made in curbing wasteful lifestyles, consumption patterns and the development dimension must be integrated into cleaner production or it will be ineffective. Challenges that need to be met if consumption patterns are to be changed and cleaner production achieved include the following:

- TNCs must clean up whatever pollution they are responsible for in developing countries.
- International environmental regulations need to be made more equitable, in order to protect weaker parties and place more responsibility on larger ones. In particular, environmental regulations must make TNCs accountable.
- Material flow-throughs in industrial economies must be tracked as a way of measuring progress.
- Consumers should be given incentives to buy environmentally friendly products, and systems of extended producer responsibility and product take-back need to be set up.
- Banks should place environmental conditions on loans to TNCs, as is done with governments of developing countries.

The policies of the World Trade Organization, World Bank and International Monetary Fund "weaken" the UN system and its efforts on behalf of developing countries, Ms. Kanniah said. She added that UNEP in particular needs much greater financial support. She urged UNEP to "fight for" equitable international regulations and increase its focus on strengthening weaker governments' environmental bargaining power.

The second plenary session was followed by a signing ceremony for the International Declaration on Cleaner Production (see page 51). ◆

Cleaner production and sustainable consumption: strategies to implement multilateral environmental agreements

Jukka Uosukainen (Deputy Director General, International Affairs, Ministry of Environment, Finland), who chaired the third plenary session, said panellists would reflect on:

- how to demonstrate the potential of preventive strategies in the implementation of MEAs and how to disseminate such strategies;
- ways to promote and ensure the practical adoption of cleaner production strategies in MEA implementation;
- how to effectively engage government, industry, civil society, etc. in the integration of preventive strategies in MEA implementation;
- which agencies at the local level (e.g. NCPCs) could be involved in facilitating MEA implementation through preventive strategies and what inputs these agencies would require to work effectively;
- ways to integrate cleaner production into capacity building related to MEAs.

Jukka Uosukainen

Introductory speaker John Hilborn (Head, Chemical and Hazardous Waste Conventions, UNEP Division of Environmental Conventions) said UNEP's objectives with respect to multilateral environmental agreements include further collaboration, synergies and interlinkages among MEAs and strengthening governments' capacity for implementation. A recent UNEP study identified 500 multilateral agreements related to environment, of which 41 were considered of global importance. The study pointed to needs that MEA secretariats felt the agreements were not meeting effectively, such as:

- identifying and making available alternatives to bad environmental practices;
- quantifying and publicizing the economic benefits of good environmental practices;
- developing effective economic instruments and incentives.

Over the past 30 years, he observed, the international community has put forward international environmental policy primarily through MEAs, so that these agreements have had to be as effective as possible. Cleaner production can play a role here, yet the potential for improving MEAs' effectiveness remains largely untapped.

Scientific studies indicating declines in or threats to biodiversity and ecosystem integrity can lead to public perceptions that MEAs and the associated tools and funding mechanisms are ineffective. The background paper to this session, Mr. Hilborn pointed out, identifies gaps in MEAs' effectiveness (e.g. insufficient awareness, communication, capacity building and financing, along with a lack of ways to measure progress).

Looking at the five issues to be discussed by the panellists, he suggested the following actions:

Issue 1: Demonstrating the potential of preventive strategies in the implementation of MEAs and disseminating such strategies

- Where necessary, continue to build trust as a prerequisite for co-operation.
- Develop strong arguments showing that better awareness and cooperation on cleaner production initiatives can result in mutual benefits.
- Define the target audience strategically.
- Challenge the target audience to be more proactive in selling the benefits of the cleaner production approach to MEA implementation.
- Have cleaner production experts extend assistance to civil society organizations, productivity councils, chambers of commerce and industry, universities, etc.

Issue 2: Promoting and assuring the practical adoption of cleaner production strategies in MEA implementation

- Stress the urgency: the costs of ecosystem destruction are being felt, and cleaner production is a ready answer.
- Have MEA secretariats define the cleaner pro-

Parallel session: Facilitating organization perspectives

Chair: Donald Huisingh (Center for Clean Products and Clean Industry, University of Tennessee, United States). Introduction: Warren Evans (Director, Environment and Social Safeguard Division, Asian Development Bank, Philippines). Panellists: Martin Rocholl, Director, Friends of the Earth Europe, The Netherlands), Yuji Yamada (Special Adviser to the Secretary-General, Asian Productivity Organization, Japan) and Christoph Beir (Director, Planning and Development, GTZ, Germany).

The focus of the session was on successful models – organizations, activities, products – that various groups have used to promote sustainable production and consumption. Examples of facilitating organizations include NGOs, universities, cleaner production centres and round tables.

The major issues that emerged from the discussion were:

- How to "facilitate the facilitator" and discover mechanisms for multistakeholder partnerships from the financial institution perspective. A key suggestion was that the role of the local community, as a central stakeholder in CP promotion, must be emphasized.
- The links and synergies possible among various stakeholders – financial institutions, educational institutions, NGOs, consultants, employer organizations, etc. What role can such organizations play in mainstreaming cleaner production and how can the synergies be discovered and exploited?
- Financing of cleaner production at micro level. Panellists and participants expressed concern regarding cleaner production financing for SMEs. The role of local, national and international financial institutions in training, R&D and implementation also emerged as an important focus.
- Eco-taxation as a policy tool to promote cleaner production. This was a point emphasized by NGOs. Reference was also made to ecological tax requirements and resource taxes. Trade action, trade restrictions and corporate accountability were also mentioned.
- Eco-ratings/eco-labelling to provide incentives for mainstreaming cleaner production.
- Whether it is possible to achieve cleaner production without transfers of clean technology to developing economies. Participants stressed the economics of technology transfer at affordable cost.
- The role of educational institutions in cleaner production promotion and development. In particular, possible synergies with other organizations were discussed.

In general, the overall emphasis of the session was on policy level intervention for cleaner production promotion. The fact that cleaner production awareness-raising is still necessary, more than a decade after the concept was introduced, was underlined.

duction needs involved in various agreements.

- Have NCPCs and other stakeholders help MEA secretariats determine which obligations under an MEA might best be achieved by a preventive approach, and have the secretariats and NCPCs work together to identify an active role for NCPCs at MEA negotiation and implementation meetings.
- Build optimism by using the UNEP/UNIDO global network to promote cleaner production awareness and cooperation to maximum advantage.
- Expand the NCPC network and provide expert services to companies.
- Make cleaner production a national priority in policy development on implementing MEAs.
- Address developing country concerns about technology transfer.
- Ensure that MEA secretariats are aware of the full power and potential of cleaner production.

Issue 3: Engaging government, industry, civil society, etc. in the integration of preventive strategies in MEA implementation

(Mr. Hilborn noted here that the UNEP DTIE Production and Consumption Branch is a ready resource with broad experience in multistakeholder dialogue.)

- Forge partnerships founded in the notion of multiple benefits.
- Engage youth, tomorrow's consumers, who will inherit the effects of MEAs.
- Develop an intergovernmental framework allowing developing countries to engage in MEA development and implementation more effectively.
- Introduce cleaner production as an issue to be addressed under the formal structures established to enhance interlinkages and synergies among MEAs.
- Ensure that intergovernmental assessments of environmental change provide a common knowledge base for stakeholder engagement.

Sachiko Kuwabara-Yamamoto and Mayra Sanchez-Osuna

Issue 4: Which agencies at the local level (e.g. NCPCs) could be involved in facilitating MEA implementation through preventive strategies and what inputs would these agencies require to work effectively?

(Mr. Hilborn added to this issue the need to find opportunities at the local level to change behaviour and close the communication gap between national authorities and industrial and commercial interests.)

- Exploit the strong bonds that NCPCs, working with a network of cleaner production practitioners, have with national authorities and with industrial and commercial interests.
- Link MEA goals to UNEP's work to enhance the engagement of civil society, including NGOs, business and industry, and national and local authorities.

Issue 5: Integrating cleaner production into capacity building related to MEAs

(And, Mr. Hilborn added, "finding opportunities to provide more focus on MEA implementation as a moral commitment for all stakeholders and to foster better understanding of stakeholder roles.")

- Make cleaner production a priority area for capacity building.
- Position NCPCs so they can participate as full partners with MEA-related implementation bodies in support of convention capacity building.

Sachiko Kuwabara-Yamamoto (Executive Secretary, UNEP Secretariat for the Basel Convention) said a ten-year strategic plan for implementing the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal includes engaging industry, governments, citizens and other stakeholders as one of its key elements. The 1999 Basel Declaration on Environmentally Sound Management emphasizes the need to focus on waste reduction, including preventive and life-cycle approaches, and calls for active promotion and use of cleaner technology.

Ms. Kuwabara-Yamamoto gave examples of the kind of initiative that will help integrate cleaner production into implementation of the Basel Convention:

continued on page 20

Parallel session: What next? Technology

Chair: Thomas Johannson (Executive Director, IIEEE, Lund University, Sweden).
Introduction: Ken Geiser (Director, Massachusetts Toxics Use Reduction Institute, University of Massachusetts, United States).
Panellists: Iain Gillespie (OECD Biotechnology Unit, France), Irina Souproun (Manager, Cleaner Technology Centre, Ukraine), Monthip Sriratana Tabucanon (Deputy Director-General, Department of Environmental Quality Promotion, Thailand) and Babajide Alo (Centre Director, Department of Chemistry, University of Lagos, Nigeria).

The session focused on opportunities represented by new hard and soft technologies for achieving sustainable prosperity. Participants concluded that emerging technology areas, including information technology, biotechnology and nanotechnology, offer excellent opportunities to improve environmental performance, but such positive applications of the technologies will not just happen. It is essential for the cleaner production perspective and philosophy to be well integrated into the development and implementation of the technologies.

Appropriate technology is a precondition for sustainable prosperity, but more than that is needed. The social component, in particular, has been largely neglected. Effecting cultural and structural changes is just as important as technological changes.

Even though it has long been recognized that transferring dirty, outmoded or banned technology from North to South is unacceptable, this is still common practice. Enterprises in developing countries too often lack capital and hence are willing to buy cheaper, "low-grade" technology. To stop this practice will take effective implementation and enforcement of multilateral environmental agreements. Proposed mechanisms for preventing transfers of dirty technology include "transparency of transferring processes" and "extended supplier responsibility".

It is increasingly clear that a paradigm shift is necessary, from simple transfer of high-tech hardware from North to South with no adaptation for local circumstances, towards transfer of knowledge and know-how so that appropriate technology can be developed locally. Capacity building and empowerment of local organizations are essential.

Parallel session: What next? Support

Chair: Mečislav Kuraš (Head of Department of Environmental Chemistry, Institute of Chemical Technology, Czech Republic). Introduction: Mark Kasman (Senior International Information Officer, Environmental Protection Agency, United States). Panellists: Prasad Modak (UNEP Textiles Working Group, India), Desta Mebratu (President, Ethiopian Society of Chemical Engineers), Mehti Wecharatana (Center for Environmental Engineering and Sciences, New Jersey Institute of Technology, United States), Jörg H. Schäfer (Aluminium Association Germany) and Ard Kant, Deputy Head, Manager Relations and Finance, SANet (Sustainable Laternatives Network) talked about the SANet and UNEP-GEF Networks.

The discussion concerned the need for a mechanism to facilitate collaboration and coordination among cleaner production advocates world-wide. The key issue was that effective action requires informed decisions, but there is no formal mechanism for coordinating information exchange world-wide among cleaner production advocates, practitioners and decision makers. A recent UNEP survey of NCPC web sites found that a lot of information exists but is not very user-friendly, and that despite a thirst for information and training, business people are not spending much time on the Net. The importance of marketing to target audiences has not been recognized. UNEP wants to have an effective global cleaner production network set up by the end of 2002.

Counselling and education are also needed, to move people from information to knowledge. UNEP offers a wealth of publications and training materials, but not much information on cleaner production web sites, and there is considerable repetition. Among the many problems regarding current sites and networks are that:

◆ information exchange is supply-driven;
◆ the quality and depth of content are uneven;
◆ information upkeep is a major weakness and site information is often dated;
◆ most databases tend to be restricted to the manufacturing sector and its needs;
◆ most cleaner production information networks are maintained by international agencies and governments, while most "real" information is in the private sector;
◆ many SMEs must depend on equipment vendors for advice and information;
◆ information focuses more on what works than on what doesn't, though valuable lessons could be learned from the latter;
◆ there is still widespread resistance to using e-based information;
◆ more customized information is needed;
◆ some users have only outdated computer equipment.

Developing countries have different cleaner production information requirements than do developed countries, and many principles and practices (which may promote or detract from cleaner production) can be traced to community traditions. Context relevance and user friendliness are vital. Most African countries, for instance, have a very limited range of industries and most companies are SMEs. Most industries in Africa either lack Internet access entirely or are handicapped because downloading information is difficult and takes much too long. Improved accessibility is needed, along with development of user-friendly search engines and instruments, and enhancement of the capacity of national information models.

When developing countries are exposed to the global market without preparation, it results in significant deindustrialization domestically. Cleaner production has to be presented as a way for companies to be more productive and survive. Regional working groups' knowledge of the context and needs in their area should be utilized.

> From the beginning, think about how you are going to market [cleaner production] centres to your audience
>
> **Mark Kasman, US Environmental Protection Agency**

Another reason information sharing is so important, especially for developing countries, is that experts who really know cleaner production and its social and economic aspects are rare, whether in government, NGOs, academia or industry. Some existing information sharing centres were mentioned:

◆ information clearinghouses at EPA and Environment Canada;
◆ National Research Center, United States;
◆ IGERT: Integrative Graduate Education and Research Traineeship Program;
◆ New Jersey Institute of Technology;
◆ ADB Centers in Thailand.

The importance of benchmarking and environmental performance indicators was emphasized. As opportunities to earn consulting fees may work against information sharing, joint information ownership agreements are needed.

Participants were told that the German aluminium industry had gathered a great deal of information in the course of various initiatives related to sustainability, such as stakeholder dialogue, supported research and a voluntary programme to reduce greenhouse gas emissions. Indeed, there was so much information, the industry needed a tool to help prioritise it. A survey of internal and external stakeholders indicated that climate change was the biggest challenge facing the aluminium industry, so information in such areas as GHG emissions and energy consumption was given priority. The key challenges now are systematic introduction of environmental indicators for the industry and intensification of stakeholder dialogue.

The Sustainable Alternatives Network, or SANet, an Internet-based tool, was introduced. ("We are intermediaries between technologies and the people who need them.") For example, SANet is producing Internet directories in such areas as best practices and best policies. The network can also provide grants in special situations where extra diligence is needed. It even offers customized counselling, e.g. to a single entrepreneur in Bangladesh or Bolivia.

Delegate questions and comments

A delegate involved in starting Cleaner Pproduction Centres in the Middle East asked for pointers on what has and has not worked. Mr. Kasman stressed the importance of knowing the purpose of the cleaner production information network and who the target audiences are. Make sure that the information is practical and timely, he said, and that there is a mechanism for regular updating. Technical and policy information is especially needed. NCPCs in the United States don't want to be told what to do by Washington, since they know the best information is out in the field.

"A mistake we made," said Mr. Kasman, "is that we didn't market ourselves to users in a very coordinated fashion. From the beginning, think about how you are going to market the centres to your audience. First, identify your stakeholders and get their agreement to create a web site. Much has been done in Asia and Latin America that new centres could learn from."

A delegate said it was important for environmental indicators to be universally comparable and not just useful for a particular industry. Mr. Schäfer said the aluminium industry was aiming at such comparability.

The cleaner production network needs quality information from the beginning, but it is very difficult to obtain, another delegate pointed out, adding that the Internet is not always the best vehicle for sharing information, particularly in parts of the world without good computer access.

A delegate involved in developing a commercial web site targeting both large companies and SMEs (the purpose being to enable updating), asked for ideas regarding prices. Another delegate suggested basing prices on the target audience. Still others expressed some discomfort with charging for information, as experience indicates SMEs feel they can't afford to pay for information. It was suggested that the system include third-party sponsorship for those who need it.

- collaboration between the Basel Secretariat and regional Cleaner Production Centres on implementation, education and demonstration projects;
- information-sharing on measures taken to reduce hazardous waste generation;
- cooperation on already-defined areas of mutual interest between the Basel Secretariat, other MEA secretariats and regional Cleaner Production Centres, such as capacity building, science and technology, information and awareness-raising campaigning and support services (indeed, she added, governments have encouraged such cooperation);
- cooperation with other MEA secretariats concerning ship dismantling, which can endanger human health and the environment (again, technical, legal and working groups are already collaborating in this area, and the International Labour Organisation is involved through its interest in protecting workers).

Sibbele Hietkamp (Council for Scientific and Industrial Research, South Africa) focused his comments on South Africa, which faces special challenges in the areas of climate, economy, social issues and health. South Africa is a dry country where irregularity of rainfall can cause crop failures; meanwhile electricity is abundant and cheap enough that there is little incentive to save energy. The latter point is of particular concern because the country's power is largely coal-generated and its CO_2 emis-

Parallel session: What next? Approaches

Chair: Somporn Kamolsiripichaiporn (Deputy Director, Environmental Research Institute, Thailand). Introduction: Bebet G. Gozun (Clean Cities Center of the League of Cities of the Philippines). Panellists: John Hay (Director of Professional Training, International Global Change Institute, University of Waikato, New Zealand), Tarcisio Alvarez (Economic Affairs Officer, UN Department of Economic and Social Affairs) and Gerard Zwertsloot (Senior Consultant and Researcher, TNO Work and Employment/TNO Arbeid, The Netherlands).

The session presented and discussed approaches and tools to evaluate, implement and/or communicate cleaner production as a means to achieve the goals of sustainable development. The presentations highlighted what has worked, based on experiences in the last decade, and constraints on disseminating cleaner production worldwide. The discussion resulted in proposals for strengthening existing tools and promoting new ones. The main points of the discussion were as follows.

Intensive work has been done over the last decade in promoting and applying cleaner production world-wide. This work has resulted in the development of a broad set of tools, which can basically be categorized as tools for:

- analysis (e.g. environmental benchmarking, environmental auditing, life-cycle assessment and environmental technology assessment);
- action (e.g. environmental management systems and economic instruments);
- communications (e.g. corporate reporting and award programmes).

However, despite the relative successes, more effort is needed to give new impetus to cleaner production and increase its uptake. Several suggestions were made:

- The approaches developed so far are more supply-driven than demand-driven. This trend needs to be reversed, or at least balanced.
- All available tools must be integrated for more synergy and efficiency.
- Cleaner production needs to be better integrated into all macro-level sectors, including education, banking, trade, development planning and government policy.
- Fostering partnerships among stakeholders is vital for achieving sustainable production and consumption patterns.
- The existing tools need to be reinforced and other compatible approaches incorporated, such as inherently safer technology and environmentally focused technology assessment.
- Principles and values should play a key role in the development of cleaner production approaches. "Smart" tools are needed, which reflect the concept of "doing things right" while not neglecting the basic business principle of maximizing profit.
- To maximize outreach to all stakeholders, it is important to promote cleaner production through the Internet, particularly via "e-learning".

For the future, promotion and adoption of cleaner production on a wider scale and more effectively requires developing more partnerships and capacity building; adopting a holistic approach that incorporates technical as well as management concerns; addressing concerns such as occupational health and safety issues; mainstreaming cleaner production in decision making and planning processes, as a means to economic progress and environmental sustainability; and encouraging promotion and application of new approaches such as environmental technology assessment and inherently safer production, focusing particularly on effective new approaches for promoting sustainable consumption.

For SMEs in particular, integration of existing and new cleaner production tools into existing management tools will make implementation less complicated and hence more effective and faster. Developing countries may need extra support to use such tools as LCA effectively.

sions are relatively high. Overall economic growth has been disappointing over the last 15 years, income levels vary widely, and the crime rate is quite high. HIV/AIDS is a major health problem: average life expectancy was 60 years in 1990, but by 2012 it is projected to be under 40, mainly because of AIDS. All these conditions affect South Africa's priorities in addressing environmental issues.

Mr. Hietkamp's suggestions for addressing the five issues:

Issue 1

◆ Increase the number of NCPCs and ensure that they share information effectively.

◆ Ensure good cooperation between national governments and Cleaner Production Centres. Establish win-win relations with industry.

◆ Provide education and capacity building at national level on MEA-related issues.

◆ Also at national level, provide incentives for use of cleaner production technology, and enforce related legislation.

Issue 2

◆ Encourage shared understanding of problems – not only production issues but also social, environmental and economic challenges.

◆ Identify and remove export barriers related to environmental regulations.

Issue 3

◆ Increase international and national support for capacity building through Cleaner Production Centres.

◆ Encourage active participation by South African industry associations, including small, medium-sized and large enterprises, and ensure that cost-benefit analyses are carried out.

◆ Involve appropriate government departments and ensure cooperation between them and Cleaner Production Centres on capacity building.

◆ Involve labour in education and capacity building, using tertiary educational institutions and Cleaner Production Centres.

> The role of industry can't be over-emphasized. Industry has the skills and resources to innovate
>
> **Jukka Uosukainen, Ministry of Environment, Finland**

Issue 4

◆ Build capacity in industry, government and education institutions via a National Cleaner Production Centre integrated into the international network.

◆ Focus on technical and economic issues and address them at higher levels as well as lower ones, while providing sufficient training to ensure implementation.

Issue 5

◆ Establish a benchmark of current national practice.

◆ Define goals over agreed-upon time frames.

◆ Use practical and relevant demonstration projects that are in the interest of the participating industry.

James Willis (Executive Secretary, UNEP Secretariat of the Stockholm Convention) explained the aim of the Stockholm Convention. He said the secretariat was helping countries develop measures to eliminate production and use of the persistent organic pollutants (POPs) covered in the agreement, to end stockpiling of them and to deal with unintentional production of POPs.

The convention requires use of best available technology (BAT) for new sources of dioxins and furans. The parties to the convention are reviewing a proposal to require an explanation from any country that is only promoting BAT but not using it. All parties will have to develop implementation plan based on individual country priorities.

The convention thus represents an emerging growth market for NCPCs and provides them with a good opportunity to integrate themselves into the process of addressing POPs at the national level. Financing is available through the Global Environment Facility (GEF) and other sources, including UN agencies, to help countries eliminate POPs.

Mayra Sanchez-Osuna (Team Leader, Cleaner Production Group, United Nations Industrial Development Organization) talked about UNIDO's support for international environmental agreements on international waters, ozone depletion, land degradation and POPs. She noted that UNIDO has worked on 51 POPs-related projects, including one focusing on the same tree as an alternative pesticide source. Cleaner production is explicitly involved in 15 projects being carried out as part of UNIDO's integrated programmes, which are designed to help countries overcome critical industrial development problems. For example, UNIDO is involved in a cleaner production approach to biodiversity conservation. It also participates in GEF international programmes such as one involving a strategy for abating mercury pollution from gold extraction.

Questions and comments

Delegates:

◆ While there may be a case for grassroots involvement in MEAs in developed countries, in developing countries "you have to start at the top. You need to involve and educate the top ministers and senior industry managers, because they don't know what cleaner production means."

◆ How can MEAs support sustainable development, which means supporting production processes to achieve not only environmental aims but also building the competitive capacity of developing countries?

Mr. Uosukainen, the session chair:

◆ NCPCs are one of the best tools available for promoting MEAs. The win-win aspects of MEAs have to be communicated, and "the role of industry can't be overemphasized. It's industry that has the skills and resources to innovate."

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Parallel session: Making it happen – sustainable SMEs

Chair: Arcado Dennis Ntagazwa (Minister of State, Vice President's Office, Tanzania). Introduction: Michael Kuhndt (Senior Researcher, Wuppertal Institute, Germany). Panellists: Janine Ferretti (Executive Director, North American Commission for Environmental Cooperation, Canada), Miroslav Krcma (Deputy Director, National Cleaner Production Centre, Czech Republic), Tilly Zwartepoorte (Director, VROM, the Netherlands) and Luis A. de la Torre, Executive Director, Cleaner Production Centre, Peru).

The session was devoted to three issues:

◆ Increasing SME participation proactively. What are SMEs' specific information needs and how can these be met?

◆ Determining what tools are available to integrate economic, environmental and social concerns into SME decision making.

◆ The benefits to SMEs of standardized and harmonized measuring and reporting tools. Are environmental monitoring systems (EMS) and ISO 14001 useful to SMEs? Would GRI benefit them? Do such tools need to be adjusted to attract SMEs?

Participants highlighted a need for local politicians to cooperate in cleaner production and EMS activities. They examined how an EMS programme could be applied with selected elements of ISO 14001. They also discussed whether it would be advisable for a government to encourage SMEs to participate in a programme in which they would prepare environmental plans, obtain certification and carry out reporting, using facilities provided by the government.

Other suggestions included:

◆ subsidizing the cost of internal changes required for use of cleaner production and EMS;

◆ subsidizing the additional cost of new equipment/technology for cleaner processes.

◆ incorporating information about cleaner production and EMS into the educational system.

Promoting a Life-Cycle Approach

The chair of the fourth plenary session, Christina García-Orcoyen Tormo (Member of the European Parliament, Spain), discussed the European Union's concept of integrated product policy. Panellists also commented on IPP and other approaches to life-cycle thinking.

IPP, a key EU environmental priority in the near term, seeks to minimise environmental degradation via review and, where needed, action in all phases of a product's life cycle. IPP should lead to sustainable products and services by orienting production and consumption towards sustainable development. Ms. García-Orcoyen referred to the "triple bottom line" concept and the three elements of sustainable development: economic, environmental and social. She emphasized the need for a life-cycle approach at business decision-making level, adding that an important aspect of IPP is stimulating demand for green products and services. Reinvigorating eco-labelling would be a particularly effective way of stimulating such demand. In addition, methodology is needed for applying a life-cycle approach to SMEs and in developing countries.

The first panellist, Ana Lorena Quiros (President, Eco-Global, Costa Rica), observed that the wealth that economic globalization has brought to some has not gone hand in hand with poverty alleviation. But life-cycle thinking and life-cycle management, she maintained, has the potential to reinforce and contribute to a new global stakeholder value culture that views the earth as a system. She called the Life Cycle Initiative an excellent way to bridge North-South gaps. The North lags behind the South in some ways. For example, the North would benefit greatly from information available in the South on social diversity and biodiversity – areas in which the South has been gathering data for decades, with Costa Rica one of the countries setting the pace.

Three challenges to NCPCs were identified:
- stakeholder definition/identification;
- engaging governments;
- engaging consumers, individuals and households.

Christina García-Orcoyen Tormo

Ysé Serret (Administrator, National Policies Division, OECD Environment Directorate, France) introduced the OECD synthesis report *Towards Sustainable Household Consumption*, which indicates that environmental pressures from household consumption will continue intensifying up to 2020. The OECD report recommends a life-cycle approach to decision making: first, understanding the environmental impacts associated with current consumption and production patterns, then designing integrated, coherent policy approaches aimed at changing those patterns.

Kevin Bradley (Director General, Alliance for Beverage Cartons and Environment, Belgium) said his organization is interested in promoting a life-cycle approach for several reasons: the move towards IPP in Europe has implications for packaging; excess packaging is not in retailers' interests; effective packaging prevents product loss but consumers are left with the packaging, so there is an interest in recycling; and consumers are pressuring for packaging that minimizes environmental impacts.

He suggested that the Life Cycle Initiative could:
- define and communicate the life-cycle management approach, particularly for policy makers;
- develop a link between life-cycle management and a practical approach to IPP, in particular to improved use of resources and energy;
- focus on key resource issues;
- set goals for environmental protection and improved eco-efficiency.

Parallel session: Making it happen – communicating sustainability

Chair: Bernhard Adriaensens (Managing Director, World Federation of Advertisers, Belgium). Introduction: Charles Laroche (Vice President Corporate Relations and Public Affairs, Unilever HPC Europe, Belgium). Panellists: Uchita de Zoysa (Executive Director, Centre for Environment and Development, Sri Lanka), Terje Torkildsen (Project Leader, The Environmental Home Guard, Norway), Mike Longhurst (Vice President, McCann-Erickson Europe, United Kingdom) and Christina Pinto (President, Full Jazz Communications, Brazil).

Mr. Adriaensens said advertising was one of the most important elements of change, but there are limits to its power. It cannot make people buy, on a continuing basis, what they don't desire. It does not determine consumer behaviour, though it can influence it. It cannot do the whole selling job, especially as regards concepts.

One barrier to communicating sustainability is the lack of a clear definition of sustainability. A recent report on youth and sustainability found low awareness of terms like "sustainable consumption" which may be too abstract to be meaningful to youth. Young people are very interested in sustainability once they know what it means, but they do not see any personal benefit in sustainable consumption. The challenge for communicators is to develop a positive message about sustainable consumption.

For Unilever, communicating sustainability is a key success factor because the company's goal is to respond creatively and competitively with products and services that raise the quality of life, and this is impossible without communication. Key insights obtained in a recent survey on consumer response to environmental issues included the following:
- Consumers have trouble feeling connected with environmental issues, especially global ones. They find environmental problems too big and removed. Some feel guilty about their impact on the environment.
- Personal well-being is a motivator. Some people are concerned about air pollution, for example, because it is linked with their asthma.
- Consumers are not ready to compromise on quality.
- Most consumers feel there is too much information, it is too technical, and they don't know who or what to believe.
- People want more information before they understand and trust the actions of companies. Often they consider the environmental statements of companies to be dubious.

These insights have certain implications for communicating sustainability:
- Empower consumers through innovation: Give them the ability to choose an innovative product or service to make a difference.
- Consumers must feel sustainable development is progress, not a step backwards. Sustainability must enhance quality of life.
- People don't like to be told what to do. They want a friendly relationship with the communicator.
- People buy brands, not products, and they have an emotional connection through brands.

Two examples of Unilever brand innovation that linked sustainability with consumer benefits were given:
- Unit-dosing detergent tablets for laundry and dishwashers have reduced use of chemicals in Western European countries by an estimated half million tonnes a year and led to significant reductions in packaging and transport. The tablets were presented to consumers as offering convenience, speed and economy in addition to providing significant environmental benefits.
- Unilever's Wash Right campaign, using leaflets, print media, the company web site and TV, has raised awareness and influenced many

Philippe Pommez (Vice President, Business Development and Innovation, Natura, Brazil) said that in developing countries life-cycle assessment must be adapted to local needs. NCPCs can play a role in this. The concept of sustainability implies a human factor not addressed by current life-cycle assessment methodology. (See "Life-cycle sustainability," p. 38.)

James Fava (Managing Director, Five Winds International / SETAC, United States) noted that many progressive companies now incorporate life-cycle assessment into their decision making. For example, at 3M product development teams use a life-cycle matrix to systematically address environmental, health and safety opportunities and issues. And the New York City Transit system is greening its supply chain. Such cases show that the most sustainable choice is not always obvious. He listed as specific aims of the Life Cycle Initiative:

- exchanging information on conditions for successful application of LCA and life-cycle thinking;
- exchanging information about the interface between LCA and other tools;
- carrying out educational activities on the application of LCA and life-cycle thinking;
- enhancing the availability of sound LCA data and methods;
- providing guidance on the use of LCA data and methods.

James Fava

Olga Ojeda

At the session's end Ms. Garcia-Orcoyen drew the following conclusions from the panellists' remarks:

- The economic and social dimensions must be added to LCA.
- LCA must be simplified for SMEs, especially in developing countries.
- It is important to establish common objectives and indicators, then let each country or institution determine how to reach its own goals.
- Leaders in both developed and developing countries must find the political will to tell consumers things they may not want to hear;
- Education, information dissemination and exchange of experiences need to be encouraged.◆

Nilmadhab Mohanty

consumers to change their washing habits, using lower temperatures and less water. Data show that the campaign started to work the day the economic benefits were highlighted.

Internal commitment to sustainability was considered a prerequisite for external success. Once the internal commitment is achieved, external communication is much easier.

From Sri Lanka came a Southern perspective on communicating sustainability which took issue with much of the UNEP advertising sector report to WSSD. The report refers to a better standard of living, but: "How do you define that term? For example, how can more people driving cars be sustainable? What is needed is much more efficient and comfortable public transport in our part of world." The report "lacks a holistic approach and imagination" and does not recognize new ideas influencing society. Concerns about sustainability are an important element of the anti-globalization movement.

Advertising and the media are not enough to communicate sustainability to the masses; interpersonal activities are also needed. It would be better to by-pass the North-South divide and form global alliances for sustainability, emphasizing the importance of responsibility and choice. Advertisers can choose not to promote unsustainable products and services. While consumers also have responsibility, they cannot exercise it without comprehensive information on products and services.

Norway's Environmental Home Guard is a "green living" concept and toolbox for more sustainable households (see page 86). Experience with the project has resulted in several hints for communicating sustainable consumption effectively:

- Simplify the message.
- Focus on simple tasks and everyday habits.
- Realize that achieving sustainability is a step-by-step process; there are no short cuts.
- Use both the carrot and stick (benefits and penalties): both have a role in motivating behaviour.
- Create new trends, such as the classic "less is more." Many people feel their quality of life improves when they consume less.
- Forge new alliances, especially with trend makers and innovators.
- Use community networks, e.g. local Agenda 21 projects.
- Understand that people are the most powerful media.

For the advertising industry, sustainability is an opportunity. The case for sustainability is both rational and emotional, and consumers support the aims of sustainability, so why are they not spontaneously demanding sustainable products and services? (see p. 91)

From Brazil, the world's fifth largest consumer market, came agreement that advertisers sell brands, not products: "Brands have the power to really influence people, opening channels for people to join in thoughts, behaviour, lifestyles, feelings, happiness. That is the wonderful and exciting opportunity advertisers have today." Advertising can destroy visions and self-esteem, but also build new mental models of what is possible – for example, the model of sustainable development as growth for and by people.

Delegate comments

Delegates said they were impressed with the presentations on the opportunities presented by the idea of sustainability as a "brand," and with the advertisements that some panellists showed. However, they also noted special challenges, such as how to influence the most powerful members of society and how to address the conflicting consumption patterns and needs of consumers in different countries.

Closing session: action plan for WSSD and beyond

UNEP Assistant Executive Director Jacqueline Aloisi de Larderel chaired the closing session. Participants approved 12 recommendations (see p. 9) and called for UNEP to continue to play a leadership and catalytic role to ensure their implementation, in partnership with other international bodies, especially UNIDO, the ILO and the multilateral and regional development banks.

Martin Rocholl (Director, Friends of the Earth, Europe) said all the recommendations were steps in the right direction. He was pleased with the consensus that current production and consumption patterns, if not altered, would destroy the planet. "But," he asked, "do you really believe that the recommended actions will deliver progress fast enough to meet the challenges in front of us?" To achieve sustainability, he said, eco-efficiency in the industrialized countries must increase by a factor of 10 and developing countries must make a "detour" in industrialization to avoid the destruction that has characterized the developed world's growth.

Legislation is crucial, but will "not be enough to get us where we want to go." Changes in production and consumption patterns must allow for business profit, and governments hesitate to introduce taxes and legislation designed to foster sustainability because they fear a loss of competitiveness. Nevertheless, Friends of the Earth will demand that governments institute structures and instruments needed to progress to sustainability, such as a new tax on aviation fuel.

Recalling Rajeswari Kanniah's demand for corporate accountability by multinational companies, Mr. Rocholl said Ms. Kanniah represented what people in developing countries actually think and experience. NGOs would have found her remarks modest, he pointed out. He added that, at WSSD, Friends of the Earth would demand global accountability by transnational corporations. Such a move would level the playing field – which, he said, would actually benefit most companies represented at CP7.

In closing, he said that "We need an economic and political framework for sustainability." This remark was met with loud applause.

> We need an economic and political framework for sustainability
>
> **Martin Rocholl, Friends of the Earth**

Olga Ojeda (Co-ordinator, International Affairs, Ministry of Environment and Natural Resources, Mexico) urged delegates to act quickly on the recommendations. Her ministry had believed for years that cleaner production was an opportunity, but it had taken time for the Mexican government and society to get this message. To move cleaner production to centre stage, it has to be integrated into day-to-day government decision making. To this end, Mexico's Environment Minister now participates in economic discussions in Cabinet; growth with quality has become a priority; and her ministry is working with cleaner production organizations in Mexico and participating in round tables around Latin America. Mexico recognizes the need for a clear link between cleaner production and MEAs.

Ms. Ojeda also announced that Mexico would host CP8 in 2004.

Nilmadhab Mohanty (Principle Advisor to the Director General, UNIDO) noted that UNIDO, which manages and supervises the NCPCs and does much outreach towards SMEs, would work with UNEP in acting on the recommendations. A holistic approach to cleaner production, addressing business, social and environmental issues, is greatly needed: "It is not surprising that an enterprise will introduce cleaner production

Nilmadhab MOHANTY
Jacqueline ALOISI DE LARDEREL
Milos KUZVART
Prague
UNEP's 7th International High-level Seminar on Cleaner Production
Prague, Czech Republic, April 29-30, 2002

Parallel session: Making it happen – investing in sustainability

Chair: Alya Kayal (Senior Analyst, International/Human Rights, Calvert Group Ltd., United States). Introduction: Krystina Brice (Investment Officer, Private Sector Advisory Services, International Finance Corporation, Czech Republic). Panellists: Nguyen Duc Thang (Ministry of Planning and Investment, Viet Nam), Edgar Bucaro (Executive Director, Genesis Empresarial Foundation, Guatemala), Christopher Bray (Head of Environmental Risk Management, Barclays Bank, United Kingdom) and Rosie Chekenya (Project Co-ordinator, ROSCAM Strategic Development Consultancy, Zimbabwe).

Participants discussed the lack of publicly available data on company sustainability practices, saying such data could generate significantly more support from the financial community and from enterprises for cleaner production. Also identified as a key need was awareness raising at all levels of government, in the private sector and in the population at large. Financing cleaner production through micro-finance presents particular challenges, including difficulties in designing a system to guide and train loan officers.

The following conclusions were reached:

- As cleaner production requires behavioural change that itself requires intellectual change, cleaner production must directly address decision makers' value systems.
- Internal cost management is a key prerequisite for the proper assessment of cleaner production projects by financial institutions.
- Even when cleaner production generates economic and environmental benefits, conflicts with social objectives may still exist, leading to the failure of cleaner production projects.
- Loan managers in micro-finance institutions need to benchmark and monitor customers' environmental performance.
- For commercial banks, environment is just one criterion among others. Environmental risk assessment is part of usual practice. The key considerations are the costs of compliance with existing and emerging regulations and expected pressures via the supply chain.

Participants put forward the following recommendations:

- In financial appraisal of cleaner production projects, start with an evaluation of macro conditions before moving to micro ones. Any big distortions in resource pricing will reduce the possibility of a win-win situation.
- Improve company accounting practices to reflect the true cost of water and waste management, of environmental compliance and of risk.
- Actively promote awareness and commitment of decision makers.
- Use targeted environmental funds to help support cleaner production investment before commercial banks take over.
- Encourage the banking sector to customize decision making in favour of cleaner production.
- Promote cleaner production through the mass media.
- Build financial institutions' capacity for assessing and monitoring cleaner production investments.
- In the absence of collateral, focus on the cash flow implications of a project to make it attractive to financial institutions.
- Even when subsidized financing is required, commercial banks can play a role, e.g. in providing expertise on screening projects and assessing proposals.

much more readily if it makes them more profitable and competitive." Since poverty is the most urgent problem in developing countries, it is crucial to bring down the cost of the environmentally friendly technologies needed in such countries – by subsidy if necessary.

Arcado Ntagazwa (Minister of State, Office of the President, Tanzania) described cleaner production as a very important building block, if not the cornerstone, of sustainable development, and underlined that developing countries must urgently eradicate poverty: "Poverty dehumanizes. Desperation leads to suicide or terrorism." Given this urgency, many people in developing countries can't see why they shouldn't use environmentally harmful processes just as the developed countries did. The challenge is to convince them of the need to "leapfrog" to sustainable technologies. Global sustainability requires galvanizing both North and South: environmental issues know no borders. What is needed is less emphasis on the differences between North and South, and more on international cooperation.

Delegate questions and comments

- On taxing aviation fuel: many taxes are not spent the right way: the proceeds are used for activities that do not support the sustainability goals of the tax. Whoever collects the taxes has to be accountable.
- More emphasis is needed in the recommendations on the role of governments as large potential consumers of green products.
- On the need for a political and economic framework for cleaner production and sustainable consumption, UNEP should hold a "brainstorming session on the ministerial level" before WSSD. (Such a session had already been planned, and was held after CP7.)
- Mr. Rocholl's comments, particularly on the magnitude of the eco-efficiency challenge, were very pertinent, as were Mr. Ntagazwa's comments on the urgency of poverty alleviation and the need for industrial leapfrogging. The recommendations should better reflect these concerns. (Mr. Rocholl responded that leapfrogging requires funding and technology transfer, which, in his view, developed countries owe to developing countries, "as we have overused their resources.")
- UNEP is the only source of cleaner production knowledge in Asia. Cleaner production should be included in higher-education curricula.

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Comments on CP7 by directors of Cleaner Production Centres

Directors of Cleaner Production Centres were asked to share their impressions of CP7, reflect on their experiences in recent years, and highlight new areas of innovation. Their responses reflect some of the differences and priorities in various countries.

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The Hungarian Cleaner Production Centre (HCPC), established at the Budapest University of Economic Sciences and Public Administration, has made effective use of its unique position. First, being located at a higher education institution, the Centre is able to share first-hand experiences and insights on environmental management and environmental policy issues with students. The Department of Environmental Economics and Technology – the HCPC's host institution – runs several courses at the undergraduate, graduate and Ph.D. levels. Every year at least 80% of business and economics students learn the basics of environmental management and economics, including principles of cleaner production. By working with an expert staff that has both an economics and engineering background, the HCPC has a definite advantage over other similar institutions in regard to environmental policy consulting, corporate environmental strategy and management, environmental marketing, environmental reporting and environmental accounting/controlling.

By providing services in the above-mentioned fields, the HCPC can set up projects aimed at fostering cooperation among different environmental stakeholders, e.g. government agencies, companies, environmental NGOs and professional organizations.

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CITET has been involved in promoting cleaner production practices since 1997. This effort has been evolving with experience, in order to achieve an adequate level of efficiency for streaming cleaner production in industrial enterprises. A noteworthy initiative was launched in 2001 for integration of cleaner production, with the implementation of ISO 14001 in a group of 12 enterprises operating in the mechanical and electrical, oil recycling, dairy, soft drinks, paints and tyre production sectors, as well as two municipal waste treatment plants. The programme consisted of providing training and technical assistance to the enterprise for a period of 18 months, to terminate with ISO 14001 certification.

After 15 months all enterprises except one have developed a cleaner production programme and adopted it as the Environmental Management Programme required by the ISO standard, with a specific focus on pollution prevention, sound management of resources and integration of clean processes. The EMS system is currently in place, and the companies have begun the testing stage previous to applying for third-party certification (planned by the end of 2002).

Among the lessons learned from this experience is the difficulty and reticence shown by enterprises when one attempts to bring them into the programme. There is a need to overcome the perception that an environmental programme means additional costs and effort. A major driver was competition among international firms, as Tunisia is opening its economy and signing a free trade agreement with the European Union that will be effective in 2007. Enterprises expressed more enthusiasm as they advanced EMS implementation and realized that integration of cleaner production and EMS is the best approach to achieving continuous improvement, rather than merely focusing on achieving compliance with environmental regulations. In using this approach, the EMS will sustain cleaner production implementation and its full integration in the enterprises' management systems as an effective strategy to strengthen their competitiveness. It is expected that these companies will serve as catalytic examples to encourage others to stream cleaner production in their operations, allowing CITET to disseminate this approach full-scale in industry.

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CP7 was remarkable as a meeting of people from various fields and sectors, all dedicated to promoting cleaner production.

The launch of the Life Cycle Initiative and the presentations and discussions were very relevant to the newly emerging economies, particularly with regard to planning and initiating activities based on a life-cycle approach, eco-design and environmentally beneficial alternatives. The life-cycle approach not only benefits the environment, but also provides new business and employment opportunities. This approach can help alleviate poverty and improve the living conditions of the poor in the developing world. It is important for this work to continue, and the application of life-cycle thinking should be mainstreamed into manufacturing and other economic sectors in these countries.

Sustainable production and consumption is a most relevant issue today. During the sessions, useful information was conveyed and exchanged about designing cleaner production programmes for other countries. The key issues raised by some of the panelists are very pertinent to many developing countries.

Although the parallel sessions in which I participated (Industry, Technology and Sustainable SMEs) were insightful, some discussions were limited due to time constraints. The session on Sustainable SMEs was exceptionally well-organized and useful, particularly in the context of developing countries (where most enterprises are SMEs).

Overall the proceedings at CP7 were relevant, informative and useful. The new contacts made and meetings with other dedicated colleagues provided additional encouragement to our young NCPC to move ahead and meet the challenges of sustainable development.

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Central American economies must be resourceful to offset the impact of decreasing public spending and private investment. As the financing and promotion of cleaner production projects would benefit priority sectors, selecting clients effectively and providing the best service is important. We must therefore dedicate much time and effort to building cooperative business relations among industry, government and NCPCs.

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The Centre decided to work very closely with city and municipal councils through the Sustainable Cities Programme (SCP) units, which coordinate and implement urban environmental programmes. The SCP's approach is exclusively participatory in nature, involving various stakeholders in the city or municipality through working groups.

Working with this model, we aimed to reach a wider audience and a varied clientele at the grassroots level. Normally we develop a cleaner production capacity-building programme involving the various stakeholders. It is of major interest that, using this approach, one creates an opportunity for the "regulators" (municipalities) to work with the "regulated" (enterprises) and appreciate together the advantages of the preventive and proactive environmental strategy to industrial pollution.

Through this approach one attempts to remove barriers between law enforcers and those in compliance by encouraging the parties to sit down and work together in a neutral atmosphere.

Working with municipalities is also advantageous and cost-effective in that the enterprises participating in the cleaner production programme are limited to a given area, making in-plant training and post-training follow-up less involving from a logistics and cost perspective.

A localized approach is conducive to the formation of Waste Minimization Clubs or Circles (WMC), which are catalytic in assuring the sustainability of cleaner production activities in the respective municipality.

Our Centre has been designated the coordinator (National Ozone Office) of the Country Programme for the phase-out of ozone-depleting substances under the Montreal Protocol. This has enhanced the Centre's image and broadened its mandate. Through implementing programme activities it has encountered a unique clientele with specific problems, consequently influencing and enhancing perceptions of the Centre regarding environmental pollution issues. The government is considering involving the Centre in more MEAs, which should have a positive effect with respect to the Centre's sustainability.

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As a new entity in Uganda, UCPC started its operations in October 2001. It is hosted by the Uganda Industrial Research Institute in the Nakawa Industrial Area. The Centre has initiated three unique programmes: an Eco-Benefits Programme, a Cleaner Production Financing scheme for enterprises in Uganda (in collaboration with UNEP) and an eco-design programme for product innovation in Ugandan enterprises (in collaboration with UNIDO, the Technical University in Vienna, Austria, and the Delft Technical University in the Netherlands)

The Eco-Benefits Programme is a ten-month package programme to help companies minimize the costs of a cleaner production project. It provides company staff with comprehensive know-how and on the job training in cleaner production, enabling the companies to continuously improve through in-house capacities once the programme has ended. UCPC experts provide comprehensive technical assistance, as well as supervision of in-plant assessments and of implementation of cleaner production options. Companies that successfully complete the full programme will receive a cleaner production certificate.

Training between 22 May and 17 July 2002 involved 28 participants (14 consultants from various consultancy firms and 14 employees from seven enterprises). After training, the programme proceeded with implementation, evaluation and follow-up within participating enterprises.

The Cleaner Production Financing Programme is targeted at financial institutions interested in supporting cleaner production implementation in enterprises and increasing cleaner production awareness in the financial community. UCPC, with assistance from UNIDO and UNEP, conducted Cleaner Production Financing Awareness Seminars for chief executives and middle bank managers in June 2002.

The eco-design programme is intended to encourage increasing awareness of sustainable product innovation. UCPC organized a two-day eco-design training workshop for enterprises in August 2002. It also participated in the UNIDO survey project. The Centre hosted an intern student from Delft Technical University (July-August 2002), who conducted a preliminary product innovation survey in enterprises in Uganda.

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At each cleaner production seminar I value most highly the discussions on experiences in implementing the cleaner production strategy under different conditions. At the Seventh International High-level Seminar (CP7) the concrete examples of procedures for integrating preventive approaches/ cleaner production strategies into other activities were very insightful.

An important shift can be seen from production towards products ("From Cleaner Production towards Cleaner Product"). But this also works respectively: inspired by the complex life-cycle analysis approach, we aim at monitoring the impact of selected measures of a cleaner production project on the technology life cycle.

Current waste management issues are associated with products. Wastes and pollution from end-of-life products attract more attention than production wastes and pollution, as these are reduced and controlled by sectoral legislation. An example might be end-of-life vehicles and electroscrap – an enormous increase in amounts of waste is directly linked with an increase in consumption and shortening of the product's life cycle.

First of all, it is a question of changing the consumption formula that would lead to sustainable development. A product that retains its environmental friendliness throughout its whole life cycle needs to meet consumer requirements. It must not lose its quality and utility properties and must be safe. Experiences and methodological procedures of cleaner production projects related to production can also be used for product change.

The path from political consensus to day-to-day reality can be long and complex. This also holds true for the preventive approach to environmental protection. Cleaner production should logically be perceived as a natural approach – an obvious first step – towards viewing the proposed measures. It should become a part of other projects and programmes, especially programmes for regional and territorial economic development. However, its application is not commonplace yet.

In the course of transition to market economy, certain time periods required by companies/enterprises and their management to acquire stability (primarily economic) must be considered. As soon as they achieve this and are able to consider their development at least on the medium-term horizon, they start being interested in options for environmental protection solutions (resulting especially from new legislation and control of its compliance) using voluntary activities. While a stabilized company can identify the advantages of a preventive approach and make the best of it, it is able to estimate the benefits of a cleaner production project and accept the implementation of environmental management systems.

In economically unstable companies with out-of-date technologies, where a cleaner production project could in fact bring the greatest benefits, the cleaner production strategy is perceived as a superstructure that "can wait for some time". Such companies will not implement cleaner production without support, or may not finish the project. At the same time, support can be counterproductive: with respect to the low standard of management or existential problems, it does not result in reducing the environmental load but only postpones its breakdown. The knowledge and approaches acquired by employees in the course of cleaner production training are usually surmounted by social instability.

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It is rewarding to verify the evolution of the acceptance, adoption and dissemination of the cleaner production approach in Brazil in recent years.

Local state cleaner production initiatives have been established in at least ten Brazilian states. Eight of them have experienced capacity-building of their human resources by the NCPC of Brazil (called CNTL, Centro Nacional de Tecnologias Limpas, which is legally an operational unit of SENAI, the National Service of Professional Education).

In this context a significant amount of industries already actively include cleaner production in their production strategies.

At Mercosul (which refers to the Common Market of the South, including Argentina, Brazil, Paraguay and Uruguay) a five-year project begun last February focused on SMEs in these four countries. In Brazil, CNTL was chosen to carry out technical coordination at the national level.

The Third International Forum on Cleaner Production, held in Rio de Janeiro on 26-27 June 2002, was organized and conducted by CNTL in partnership with important local actors like CEBDS, FINEP and SENAI-RJ. Oral presentations and roundtables discussed recent evolutions in the cleaner production process in Brazil. There were contributions from Chile, Ecuador, Germany and Paraguay.

The need to create a National Cleaner Production Policy in Brazil is being stressed by many actors. The concept has also been recommended for inclusion as a guiding principle in the Brazilian National Solid Residues Policy draft. Corresponding final discussions are being held at the National House of Representatives.

Meanwhile, cleaner production has also become a theme for graduate work at some Brazilian universities and a focus for research development support agencies.

Under such circumstances it is rewarding to know that the activities of Brazil's NCPC, in synergy with other local institutions, are making a significant contribution to the recognition, acceptance and actual implementation of the cleaner production concept, principles, methodologies and techniques in this country.

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The Cleaner Production Center of Nicaragua has experienced great success at national level by applying step-by-step introduction of the advantages of cleaner production and cleaner production methodology among relevant stakeholders. First the academic sector was approached, and awareness-raising and training activities were carried out. Then the private sector was invited to produce national successful case studies, supported by the already trained academic group. Next efforts were focused on dissemination of the national success stories, inviting associations and chambers of industrial and services companies. Government interest increased through recognition of the benefits of the cleaner production methodology. The International Declaration on Cleaner Production was signed by the government, and a national cleaner production policy preparation group actively promotes the need for a national approach among stakeholders. Lately the financial sector has been getting involved, which will support investments in cleaner production. Clean technology transfer is one step the CPC-Nicaragua is promoting this year.

CP7 was an excellent opportunity to get to know the latest trends regarding the promotion of cleaner production and new activities related to sustainable development that can be promoted. Cleaner production and multilateral environmental agreements, for example, opens new opportunities to continue sustainable adoption of cleaner production at national level.

Meeting and sharing with people from many different countries is a great chance to network and develop new alliances and projects.

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A few innovative strategies, attempted in partnership with Regional Cleaner Production Centres (RCPSs), Local Cleaner Production Centres (LCPCs) and regional industry associations, which have produced outstanding results are briefly discussed below.

In India there is a need to develop a large manpower base of cleaner production professionals and use their services effectively through a system of networking. Employment of such a large number of full-time professionals by Regional Cleaner Production Centres is neither economically viable nor even advisable. India's regional centres are still financially dependent on state governments. In this context networking through key resource persons seems a viable option.

Such key resource persons help promote the cleaner production movement by revolutionizing the attitudes and perceptions of industry on matters of pollution and waste through promotion, training and facilitation of implementation of cleaner production in industry. As ambassadors of Cleaner Production Centres, key resource persons function via a networking system. Each district or industrial area in a state/region will have key resource persons who are fairly well-informed about the local industry. The number of key resource persons varies according to various factors including size of the area, number of industries and type of industries.

The RCPCs associate themselves with planning, coordination and policy-related functions, whereas the key resource persons deal with the core cleaner production activities.

To facilitate exchanges between SMEs, and to contact a Cleaner Production Centre, cleaner production services are to be readily provided in regions where a RCPC exists. Help desks are often arranged on-site to provide information and assistance to individual entrepreneurs on matters related to productivity, pollution and profitability. RCPC experts with sector-specific experts and key resource persons are available in the industry association offices to provide on-the-spot assistance.

Any entrepreneurs can avail themselves of help desk services by filling out a registration form with details on the nature of the assistance required. No registration fee is required. The help desk is open once a week between 2:00 pm and 5:00 pm at the local industry association office. Information available from the help desk will be provided immediately on request. Such information, if not immediately available, may be provided at a later time.

Generic cleaner production awareness seminars without proper follow-up mechanisms have proven to be time-consuming and expensive. They are often criticized for overexposure of industries to the concept by various national and international agencies. Cleaner Production Clinics have been formed due to the demand for the creation of a target-specific information supply mechanism that emphasizes economic gain from cleaner production (preferably with existing success stories). The Cleaner Production Clinics are mainly organized by local industry (sector-specific) associations, and participants are encouraged to come prepared with their cleaner production related problems and their past experiences. Cleaner Production Clinics function as an excellent platform for cross-fertilization of information among entrepreneurs with similar types of products and production facilities.

One of the most encouraging results of the Cleaner Production Clinics has been the promotion of the establishment of Cleaner Production Circles, which was otherwise considered extremely difficult due to barriers of competition among entrepreneurs.

A target group for Cleaner Production Clinics is corporate management, to ensure their commitment and to make decisions on-the-spot concerning their willingness to form the Cleaner Production Circle in order to judge the effectiveness of the training. A feedback form for the Clinic is distributed, and Regional Cleaner Production Centres collect and compile the feedback.

On the initiative of the Industrial Development Agency and industry associations having Common Effluent Treatment Plants (CETPs), the concept of Local Cleaner Production Centres was conceived. Initially, 19 hot spots (mostly having chemical industries in the State of Gujarat and having a Common Effluent Treatment Plant) were selected for the establishment of LCPCs hosted by the CETP. LCPCs started with the sole objective of reducing water consumption, wastewater volume and load to improve the efficiency of the CETP as well as operating costs. However, the scope of services was expanded to provide cleaner production audit assistance to member units on a no-profit-no-loss basis, as well as providing infrastructure facilities required for monitoring, analysis and energy audit, etc. Technical assistance to LCPCs so far is provided free of charge by National and Regional Cleaner Production Centres.

Not only were the results of the above-discussed innovative strategies overwhelming, but the visibility of cleaner production in the region has improved appreciably. The outstanding achievement has been the increased demand for cleaner production services, capacity-building of professionals in cleaner production, and establishment of cleaner production service providers closer to the users. ◆

Sustainability is everybody's business

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Summary

As living standards improve and expectations grow in both developed and developing countries, pressures to find a sustainable development path are increasing. Achieving sustainability requires basic changes in production- and consumption-related activities. Finding ways to deliver better performance using less energy and raw materials (and creating less waste) can contribute to the improvement of living standards world-wide. Especially during the last decade, many businesses have begun to adopt a more responsible attitude towards sustainability, e.g. in the areas of eco-efficiency, social dialogue with stakeholders, and corporate social responsibility. Companies are recognizing that they must cooperate with a wide range of partners and stakeholders to become more sustainable and be successful in the marketplace.

Résumé

A mesure que les conditions de vie s'améliorent et que les attentes des citoyens des pays développés comme ceux des pays en développement s'accroissent, les pressions pour trouver une voie de développement durable s'intensifient un peu partout dans le monde. Parvenir au développement durable exige des modifications fondamentales des activités liées à la production et à la consommation. Trouver les moyens d'améliorer les performances en consommant moins d'énergie et de matières premières (et donc en produisant moins de déchets) peut aider à améliorer la qualité de la vie sur la planète. Au cours de la décennie écoulée tout particulièrement, de nombreuses entreprises ont commencé à adopter une attitude plus responsable à l'égard du développement durable, par exemple dans le domaine de l'éco-efficacité, du dialogue social avec les parties prenantes et de la responsabilité sociale des entreprises. Celles-ci reconnaissent la nécessité de coopérer avec divers partenaires et parties prenantes pour devenir plus viables et s'imposer sur le marché.

Resumen

A medida que crecen las expectativas y mejoran los estándares de vida en países desarrollados y en vías de desarrollo, aumentan las presiones a nivel mundial para encontrar una vía hacia el desarrollo sustentable. Para alcanzar la sustentabilidad es necesario implementar cambios básicos en actividades vinculadas con la producción y el consumo. El desarrollo de sistemas que generen mayor rendimiento con menor consumo de energía y materia prima (generando menos residuos) puede contribuir a mejorar los estándares de vida a nivel mundial. Principalmente en la década pasada, muchas empresas asumieron mayor responsabilidad en cuestiones relacionadas con la sustentabilidad, por ejemplo en áreas vinculadas a la eco eficiencia, la promoción del dialogo entre sectores involucrados y la responsabilidad social corporativa. Las companías reconocen la necesidad de alentar la colaboración con los múltiples sectores involucrados para lograr metas sustentables y posicionarse en el mercado.

The world scene has changed since Agenda 21 was adopted at Rio, but the basic problem of unsustainable development remains. Today it is more urgent than ever to embark on a more sustainable path. While we are still far from solving global environmental problems, the debate is gradually shifting towards the social issues of sustainability. We cannot continue to deprive a majority of the world's population of the benefits of our common development. Poor countries need to be part of the global market on much better terms than hitherto. Business is prepared to cooperate more than before with governments and civil society, so as to create a global market that can benefit everybody.

In the 1990s many companies received wake-up calls, as they were confronted by activists' demands, embarrassing media reports, disappointed staff and sudden drops in share prices. Recent revelations of accounting fraud in well-known and respected companies have shocked the investor community. They have also had a direct negative effect on the prices of shares world-wide. More than ever, transparency and ethics need to be key aspects of business practices. This is required by shareholders. But business also needs to address specific demands of other stakeholders.

"Triple bottom line" reporting is becoming the business response to stakeholders' various requests. A breach of trust with respect to social and environmental issues can dramatically erode a company's reputation and result in a substantial loss of market share. There are many examples.

A survey by Environics International, reported at the last World Economic Forum, indicated that the general public has relatively little trust in global companies.[1] This level of trust is not increasing. On the contrary, it reached a very low level following the latest accounting frauds (leading to the bankruptcy of major companies). The general opinion prevails that business is not doing enough to protect the environment. De facto, the public expects business to deliver more to the broader society. In the eyes of too many people, business is responsible for many of the negative consequences of the present development path.

The planet's health is deteriorating rapidly. There are no signs that global inequalities are narrowing; rather, the gap between haves and have-nots is growing. According to the WRI/UNEP/ WBSCD publication *Tomorrow's Markets: Global Trends and Their Implications for Business*, 78% of the world's population is poor, 11% is in the middle income category and 11% is rich.[2] More and more people perceive this situation as unfair and are demanding a new business approach that goes far beyond self-interest, thus making a greater contribution to an increase in the quality of life of all people.

Natural capital is being depleted and ecosystems degraded

The planet is in a bad shape. The present generation's ecological footprint is too large. The WWF's 2002 Living Planet Report, produced with the UNEP World Conservation Monitoring Centre, estimates that the world's average ecological footprint exceeds available bio-capacity by about 20%.[3] We are able to keep this overdraft by destroying the Earth's capital stocks of fertile land, forest and fish. And the signs are many.

The CO_2 level in the atmosphere is increasing, causing the Earth's temperature to rise and leading to the melting of polar ice caps and glaciers. The number of forest fires is also increasing around the world. Rivers are running dry. In China in 1972, the Yellow River did not reach the sea for the first time in history. In 1997, a very dry year, it did not reach the sea during 226 days. Plants and animals are taking a strong hit; they are desperately trying to adapt, but too many will not make it. There is a dramatic increase in coral bleaching, a much more dramatic event than people generally understand. 70% of marine fisheries are either fished to capacity or overfished. And there is no need to draw your attention to the increase in destructive weather events.

Poverty erodes human capital

There are also stark social inequalities. 20% of the world population accounts for over 80% of total consumption. Nearly half the world population (an estimated 2.8 billion people) lives on less than two dollars a day. Without access to simple products that could help them meet basic needs, these people are marginalized. They are not part of the global marketplace. The World Bank's Living Standards Measuring Study (LSMS), which looks at over 15 countries and 55,000 households, confirms that the poor lack basic infrastructure services in the form of electricity, piped water, sewerage, and private telephone services.[4] There are few exceptions in urban areas. If the quality of life of all these poor people is to be improved, they need to be incorporated into the market place.

World development efforts in years to come will create great business opportunities by producing new and affordable products and basic services for poor people. Consumption by the poor will increase in the coming decades. Business needs to take up this challenge, incorporating local markets that serve the poor into the future global marketplace.

Production and lifestyles

Sustainability is strongly linked to production- and consumption-related activities. Pressures to find a sustainable development path arise from the way we live, how we produce and how we consume. These pressures are growing, as living standards and expectations increase in developed and developing countries alike. Furthermore, we cannot ignore the fact that the world population will grow rapidly (by about 80 million a year) in the decades to come. We will probably reach a level of approximately 9 billion people around 2050.

Industry has considerable economic, environmental and social significance. The current world production system is unsustainable due to the constant increase in resources used and waste produced. Industry needs to ensure that the present modernization and globalization of activities bring production and use of products within the framework of sustainability. We need to decouple growth from material and energy. Thus, we need to accommodate more growth while using less material and energy. To match the unavoidable future increase in the world's throughput, we must increase our efficiency, adopt new technologies more rapidly, and stimulate radical innovations.

The market is the only system that can pull us in the right direction – provided, of course, prices are not distorted by perverse subsidies. We need honest prices to drive the transformation of technologies towards the reduction of pollution and of resource consumption. Governments must assume their responsibility by supporting full-cost pricing.

Sustainability is best served by open and competitive markets that allow the use of different countries' comparative advantages. The developed world must open up for basic products coming from the developing world. In turn, the developing world must open up for trade – liberalizing internal markets and introducing the necessary infrastructure reforms to allow international trade to flourish.

Technology assumes a very important role in ensuring that sustainable production systems are also competitive in the marketplace. Not only is it used to make things, but it also influences our expectations concerning lifestyles and consumption patterns. Our present unsustainable culture of consumption is strongly influenced by technologies that support modern communications, advertising, media and fashion. It spreads rapidly to the rich and middle class citizens of developing countries, who can now be observed beginning to spend their free time in shopping malls.

How is business responding?

During the last decade most business began to adopt a more responsible attitude towards sustainability, especially in regard to eco-efficiency, social dialogue with stakeholders, and corporate social responsibility (CSR) agendas.

In the environmental field, business began with end-of-pipe and compliance approaches before moving towards cleaner production practices, which are more precautionary and cover not only manufacturing processes but also products and services (as well as taking care of products when their lifetime is over).

The World Business Council for Sustainable Development (WBCSD) stimulated more progress by promoting the eco-efficiency concept, which has the following seven aspects:

- reduce the material intensity of goods and services;
- reduce the energy intensity of goods and services;
- reduce toxic dispersion;
- enhance material recyclability;
- maximize sustainable use of renewables;
- increase material durability;
- increase the service intensity of goods and services.

Manufacturing industry's response to the concept of eco-efficiency was positive, as it is easy to show that by applying an eco-efficient strategy in the production process companies (as a direct consequence) improve their economic bottom line. Forward-looking companies introduced eco-design into products to further reduce material and energy use in production processes. This also helped increase recycling as well as re-manufacturing possibilities.

In the future we will introduce information technology and advanced command and control systems ("industrial IT") across the whole industrial process. We will radically change the environment of factory floors in a way similar to that in which Microsoft has transformed the office environment. By these means production processes will become more cost-efficient and achieve optimal use of resources while minimizing waste. Processes will be remotely controlled. Employees will no longer need to be close to the process, thereby eliminating occupational hazards and avoiding harsh conditions. The new industrial IT will not only increase eco-efficiency but will also enhance occupational health and safety along the supply chain.

Getting more from less – a life-cycle approach

Industry needs to find new ways to deliver better performance while using less energy and raw materials and creating less waste. Continuous improvement in these areas is necessary to improve living standards world-wide and, at the same time, limit the size of the environmental footprint. Research and development need to focus on new technologies that reduce environment impact, in particular curbing CO_2 emissions but (equally important) improving existing products' environmental performance. These products must offer high economic performance over their complete life cycle. Only if they save time, labour and capital will they replace traditional, less eco-efficient products.

To be eco-efficient, the entire industrial process from product design and material selection through manufacturing and distribution to waste management needs be considered together. A life-cycle approach can reduce environmental impact, save energy and resources, and reduce waste.

For the industrial sector in general and certainly for most products from ABB, a global power and automation technology group, the greatest environmental impact (99% or more) usually occurs during the useful life of the product. This is especially the case for electrical products. A great deal of energy can be saved if product performance increases. Let's take the astonishing example of electric motors, most of which are designed to run full-speed in all conditions. It is like driving a car with the gas pedal fully down and regulating the speed with the brakes, but that's how most electrical motors used in industry work.[5]

Environmental management systems

An important milestone has been the introduction of environmental management systems: ISO 14001 and EMAS (the European Eco-Management and Audit Scheme). An EMS allows a company to integrate environmental improvements into day-to-day work at production sites. It has two basic elements: ensuring that production sites comply with environmental laws and regulations, and continually improving environmental performance through concrete actions.

By April 2002, registration of ISO 14001 certifications had reached a level of about 38,000 companies world-wide. Japanese industry is in the lead, followed by companies from the UK, Germany, Sweden and the United States. The number of certifications is increasing rapidly every year. The EMAS system has gained a strong hold in Germany. German companies account for 65% of all EMAS certifications so far. In addition to certified environmental management systems, it is estimated that at least 100,000 companies have implemented an EMS without external certification.

Compared with the total number of companies world-wide, the number of EMS sites is still very low and needs to increase substantially. The importance of introducing EMS at site level cannot be emphasized enough. It allows companies to introduce operational performance indicators and keep a record of environmental incidents. Moreover, EMS generates continual improvement projects. ABB estimates that it has some two to three thousand continual improvement projects running at any one time across the ABB Group. The impact of each individual project may be limited, but taken together these projects have had a huge effect in raising ABB's sustainability performance.

Without EMS, companies cannot properly account for their environmental performance. This is increasingly recognized by customers, who are demanding ISO 14001 certification by their suppliers to secure their upstream supply lines. This trend will have a significant impact on improving sustainability along the value chain. It will also serve as a very important information base for due diligence investigations concerning acquisitions and divestments. EMS contributes systematically to the environmental improvement of the production process.

Environmental product declarations

To inform customers of a product's total environmental impact, companies are starting to produce environmental product declarations (EPDs). EPDs are based on life-cycle assessments (LCAs), which measure products' environmental impacts over their entire life cycle. These impacts are measured by analyzing material and energy use, as well as emissions and waste, taking all phases of the product's life cycle into consideration (from material extraction, manufacture of the product, transportation, operation over the product's useful life, and eventual disposal or recycling). LCAs show that the greatest environmental impacts of many of ABB's products usually occur during these products' use and eventual disposal. It is very important that customers be fully informed, as their choice and use of products directly affect the environment.

In some countries (e.g. Sweden and Italy) the information in an EPD may be verified by an external verification body. This will eventually make it possible for customers to compare products' environmental performance, just as they have long been used to comparing prices, quality, delivery time and other parameters before they make their decision to buy.

"Catch 22" – the rebound effect

Eco-efficient manufacturing uses less energy and material and produces less waste. The total impact of many products is determined by their use. However, manufacturing products that deliver more per unit of input, with less environmental impact throughout their life cycle, is not enough. Products must also be able to pass the market test, in that they need to be competitive and meet customer requirements.

In view of the "rebound effect", modernization of production, eco-efficiency and the introduction of EMS are not sufficient to reach sustainability. With higher productivity and less use of material and energy, the prices of products can be lowered and consumers can (as a consequence) afford to purchase more products. Despite doing the right thing during the production phase and providing cleaner and more efficient products, the gain for the environment may be offset or even reduced by increased consumption – resulting in a net increase in the size of the ecological footprint.

Innovation – lifeline of the western world's lifestyle

Therefore, we cannot consider only the production side in measuring sustainability. We need to include consumption and life style as well. To reach sustainability, we need to find new ways to produce products and services, meeting human needs while not expanding the ecological footprint. Innovation will be increasingly important in this process. Business needs to find new solutions within environmental limits and social constraints. To find new sustainable solutions, we have to integrate consumption and production.

Efficiency strategies contain linear thinking about lowering inputs for a given activity. Sustainability strategies are concerned with finding new ways to meet human needs, focusing on the idea of product service systems required to meet these needs and on the performance required of products. We can illustrate with some examples of new compared with traditional ways of thinking (selling flooring services rather than carpets, clean clothes or cool food rather than washing machines and refrigerators, mobility rather than cars, energy rather than oil, building systems rather than cement, etc.). A change in mindset can stimulate new ideas and new innovations. Creativity will be a key word in the future.

Moreover, to enhance the sustainability effect, companies can retain ownership of their products and sell only the service performance to the customer. Ownership tends to promote more durable products and so use less of the world's resources. For example, ABB provides painted cars instead of a paint-spraying installation, turning power (torque) instead of motors, kilowatt-hours instead of generators.

This new sustainability reality is being understood by many business leaders. There have been a number of good initiatives lately to review sustainability in industry sectors (automobiles, cement, mining, energy, the fishing and forestry industries). The WBCSD has played an important facilitating role in many of these reviews.

Companies face many obstacles in applying and implementing these new strategies. Obstacles are often related to the market reality. Concerted action is needed to overcome them, as part of the innovation process. Companies must be more demanding with respect to the markets. Regulators need to be pushed to eliminate all the perverse subsidies that cause markets to send unsustainable signals.

Markets are human constructs governed by customs, values and norms, laws and regulations. They need to be shaped to serve the creation of new sustainable innovations. Business needs to activate market players and key stakeholders, including suppliers, government regulators, local community representatives, NGOs, suppliers of venture capital and future customers, so as to provide the right market framework. Very few companies today can risk developing new systems if demand is only supply driven.

Stakeholder dialogues can greatly help companies gain a better understanding of market trends, customer preferences, and the priorities and agendas of other interested stakeholders. It can open up possibilities for new common solutions.

No one can do it alone. To be successful, industry needs to cooperate with many partners and stakeholders. The market must become a pull. Governments need to establish the right framework and offer the right incentives. Media and opinion-makers need to make sustainable values fashionable and desirable. People need to know what is at stake and take responsibility for their actions. Working together is a must. Sustainability is everybody's business.

Notes

1. Around 25,000 people were interviewed in a poll conducted in 20 countries. See *www.environicsinternational.com* for more information about this organization. Several related Environics International surveys are available on the World Economic Forum web site (*www.weforum.org/site/homepublic.nsf/content/voting*).
2. See *www.uneptie.org/outreach/wssd/contributions/publications.*
3. See *www.panda.org/livingplanet.*
4. See *www.worldbank.org/lsms.*
5. Industry uses 50% of all electricity, of which 65% is for electric motors. Conventional motors always run at maximum capacity. Up to 70% of their energy could be saved by varying motor speed according to actual need for energy. Only about 5% of the world's motors are currently fitted with energy-saving drives.

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Changing production and consumption patterns: progress made and remaining challenges

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Summary

Unsustainable production and consumption patterns should change in the context of increased poverty alleviation and economic growth. As major shifts in perception and behaviour are expected, the respective responsibilities of producers and consumers need to be addressed. Cleaner production will be a central element of corporate social responsibility. Several recommendations to UNEP are made, including development of indicators for cleaner production and sustainable consumption as well as further cooperative multi-stakeholder initiatives.

Résumé

Il faut modifier les modes de production et de consommation non durables dans le contexte de la lutte contre la pauvreté et de la croissance économique. Dans la mesure où l'on s'attend à des changements majeurs de perception et de comportement chez les producteurs et les consommateurs, il est impératif de réfléchir à leurs responsabilités respectives. La production plus propre va devenir un élément central de la responsabilité sociale des entreprises. Plusieurs recommandations sont adressées au PNUE, concernant notamment l'élaboration d'indicateurs de production plus propre et de consommation durable et de nouvelles initiatives de coopération multi-partites.

Resumen

En un contexto de reducción de la pobreza y crecimiento económico, se deben modificar los patrones de producción y consumo no sustentables. Se anticipan cambios significativos de percepción y comportamiento, por consiguiente se debe apelar a las responsabilidades respectivas de productores y consumidores. La producción más limpia constituirá un elemento clave de la responsabilidad social corporativa. Se plantean algunas recomendaciones a la UNEP, incluyendo la necesidad de desarrollar indicadores de producción más limpia y consumo sustentable y promover iniciativas conjuntas con múltiples involucrados.

Change is the handmaiden Nature
requires to do her miracles with.
Mark Twain, *Roughing It*

Interest is rapidly growing in the contribution to be made to sustainable development by changing unsustainable production and consumption patterns. UNEP, which is helping to bring such changes about, will have a major role in ensuring that sustainable production and consumption concepts and practices are further developed in the future. As will be clear from the following article, UNEP needs to find partners and build cooperation if this is to be achieved effectively and equitably.

Understanding the relationships between production and consumption patterns will be key to identifying their respective deficiencies and the most effective ways to change them. However, it is important to recognize that positive changes in production patterns do not automatically lead to positive changes in consumption patterns, or vice versa. It is also becoming very clear that in some instances the concept of sustainable consumption will embrace the notions of no consumption, or of radically modified consumption. (For the purposes of this article, the assumption is that the production/consumption debate is principally an issue for market economies. I do not therefore address the relationship between the two in the context of past or present planned economies.)

Current state of affairs: overview

Economic development in the modern world remains directly and heavily linked to increased production and – its necessary corollary – increased consumption. Such development depends upon (increasingly multinational) companies producing and selling more of their products. If this is true for the highly developed countries, it is likely to remain at least as true for developing countries in which basic needs (e.g. energy, clean water, housing and basic infrastructure) are currently far from being met. There is, to be sure, a healthy debate around how to unlink or "decouple" economic development from resource use. This debate has undoubtedly increased the understanding and acceptance of the need for much greater efficiencies and waste reduction, as exemplified in the "factor 4" and "factor 10" approaches, and is to be welcomed and encouraged. Efficiency increases will remain crucially important in the foreseeable future, but it is also important to consider the possible limits to production (however efficient) in the longer term. It has become fashionable to dismiss the Club of Rome *Limits to Growth* report published in 1972 as doom-laden and hopelessly pessimistic, but one wonders how many of the report's critics would be prepared to bet unequivocally that economic growth, based on the prevailing model, will be sustainable in the longer term.

Sustainable production and consumption: the challenges

Modification of production and consumption patterns to render both more sustainable in the longer term will provide challenges for economic growth *per se* and for the distributional aspects of such growth. Nor can cleaner production and sustainable consumption remain insulated from the many other economic and social realities that are crying out to be addressed. Modified production and consumption patterns will largely be determined by needs (e.g. poverty reduction, employment creation and maintenance, resource availability, etc.) and policy responses (e.g. multilateral environmental agreements, taxation, investment and public spending, etc.).

Moreover, attempts to modify currently unsustainable production and consumption patterns need to address the respective responsibilities of both producers and consumers. In a market economy one can expect progress in cleaner production to be linked – even if imperfectly – to consumer demand. Improved production and consumption policies and strategies that ignore the crucial role that must be played by consumers will seriously miss the mark. If there is no consumer demand, or if such demand remains limited to a "niche" group, the benefits will be much less than if the demand is more generalized (though benefits may not necessarily be insignificant in particular instances). The experience of the organic food movement is perhaps instructive in this regard. The developed world in particular has a long way to go to get the sustainable consumption message across to its citizens.

Consumers in the highly developed countries have grown accustomed to the increased availability of goods and services at prices that have generally fallen over time compared to average income. The costs of many consumer durables have decreased in the highly developed countries over one or two generations (often massively) in comparison with average wages in these countries over the same period. These consumer benefits have, however, come at a cost. Many of the "externalities" of producing the goods and services being consumed (e.g. depleted resources, pollution, loss of biodiversity, undesirable impacts on the developing world) are now being recognized as the unpaid costs of largely unchecked "consumerism". An important message is that if producers – industry and business – are not the whole of the problem, they cannot be expected to provide the whole of the solution.

Unfortunately, it is generally easier and less politically inconvenient to target business and industry than to remind consumers, individually or collectively, of their responsibilities and of the downside of their consumer choices. There is something of a paradox involved. Business and industry may be prepared to "take it on the chin" since, by doing so, they stand the best chance of demonstrating good corporate citizenship (thereby protecting their licence to continue to produce and sell, ideally at increased levels). Governments, too, benefit from the fact that increased production helps secure jobs (though by no means at historical levels, given increased automation) and tax and other revenues. According to this scenario, neither governments nor companies are necessarily highly motivated to draw too much attention to the reduced consumption (as opposed to cleaner production) approach to sustainability. This suggests that there are likely to be serious structural impediments to the realization of more sustainable consumption and is an issue which cannot be ignored.

The wholesale changes in production and consumption patterns that are implied in any reasonable understanding of globally sustainable development are unlikely to be easy or uncontentious; otherwise the world would be much further advanced than is currently the case. For this reason, one needs to be wary of those pedalling easy or "obvious" solutions. Someone once remarked that for every complex problem there is usually a simple solution – which is wrong. There needs to be better understanding of the nature of the obstacles that stand in the way of more sustainable production and consumption. However, it is important to stress that simply because a challenge is difficult is not evidence that it can or should be ignored, the challenge of climate change being perhaps the best example.

It is certain that in the short to medium terms production and consumption patterns that are more sustainable will have to be developed in the context of both increased poverty alleviation and increased economic growth. Poverty and unemployment, wherever they occur, are and will remain serious barriers to the adoption of more sustainable production and consumption patterns, though the negative effects that affluence, too, has had (particularly on unsustainable consumption patterns) should not be underestimated.

Complicating the issue is the fact that neither production and consumption challenges nor producer and consumer needs are uniformly or equally distributed around the world. There is good reason to believe that achieving widespread acceptance and commitment for necessary changes will largely depend on countries in the highly developed world being prepared to shoulder a much greater share of the "transition burden". However, experience with the Kyoto Protocol and climate change mitigation efforts more generally have provided depressing examples of just how difficult it is to persuade people of the need for (and the possibility of) differential responsibilities.

Cleaner production undoubtedly needs to be a central element of corporate social responsibility, but sustainable consumption will also require considerable shifts in perception and behaviour among consumers, especially those in the highly developed countries. There is evidence that such a shift is occurring. One example is the rapid growth in ethical or socially responsible investment. A growing number of investors are developing specific approaches for investing in more sustainable industries. Such investment is typically targeted at "industries of the future" or at proven leaders in the more traditional sectors. The clear message is that more sustainable production matters, and that those who get it right can expect to profit from increased investment and the greater acceptance and good name that goes with being identified as a leader rather than a laggard.

It is true that ethical and socially responsible investment does not yet represent anything more than a small part of overall investment. However, indications are that it is on a firm upward growth curve. UNEP should enhance cooperation with the ethical and socially responsible investment community to investigate ways in which the funds that are increasingly available for such investment might be used to encourage and support cleaner production and consumption. The question remains whether consumers more broadly – especially in the highly developed world – are prepared to accept the limits to consumption that are likely to be necessary.

Lots of difficult questions, no easy answers

Against this general background, the cleaner production and consumption debate needs to be carried on at a higher level of sophistication and analysis. Serious consideration needs to be given to the contradictions that are inherent in ever-increasing production, however clean. In the final analysis cleaner production may be a necessary "evolutionary" step that will almost certainly be insufficient for achieving global sustainable development. There may also need to be a "revolutionary" approach involving a major paradigm shift profoundly affecting both producers and consumers. It will also be necessary to understand the varying impacts of differing production and consumption patterns. Some production and consumption patterns that are unsustainable in the long run may have lesser immediate impacts and may provide a "bridge" or "socio-economic breathing space" during which the appropriate transition policies and practices must be developed. At the same time, activities whose impacts are cumulative and either serious or potentially catastrophic clearly need to be identified and prioritised.

In market economies, particularly in the highly developed countries, there has been a tendency over the last two decades for governments to take a less interventionist approach than has historically been the case since the end of the Second World War. This trend has been especially discernible following the collapse of Communism. However, it is clear that while the market is good at delivering certain things, it is not as good at and sometimes incapable of delivering others. If production and consumption patterns are to become more sustainable, governments around the world will have to rethink their responsibilities. This requires, for instance, addressing the all too frequent "perverse" subsidies that are the very feedstock of unsustainable production and consumption patterns. It is interesting to note that there is evidence of slowly increasing support from the private sector for an enhanced governmental role, notably in the form of large and multinational companies seeking market stability and a level playing field as a fundamental prerequisite for doing business.

Changing production and consumption patterns need to be a part of a longer-term approach to a more sustainable future. If, as I believe is highly likely, sustainable production and consumption patterns will ultimately require seismic shifts in the way we run both our economies and our personal lives, there will inevitably be major upheavals for those whose livelihoods are currently linked to old (unsustainable) ways. On one hand, the more rapid the change the more likely the social and economic disruption; on the other, the sooner one starts seriously to address a problem the less chance it will need to be addressed later on in panic. Whatever happens, there will have to be a lot more honesty and willingness to accept that there are bound to be winners and losers in any meaningful change to sustainable production and consumption patterns.

"Win-win" or "win-win-win" options should certainly be pursued wherever possible – after all, they are by definition efficient, but they will not always be available. And distinctions have to be made between macro-economic and micro-economic impacts. It is all very well for analysts to comment that the net effect of change will be economically, socially or environmentally positive "on average". One could also argue that a person who sleeps with his head in a refrigerator and his feet in an oven will "on average" have a comfortable body temperature. The devil, as they say, is in the detail. Managing change and dealing fairly with those most adversely affected will be crucial to the pace, the extent, and indeed the very success of such change. In short, for the debate on cleaner production and consumption to lead to a widely supported global commitment, it will need to be carried on beyond the walls of academia and the intellectual elite and engage the hearts and minds of a much broader spectrum of society.

It has been correctly said that turkeys rarely rejoice on Thanksgiving Day. We should therefore not be surprised if those who stand to lose their jobs, livelihoods and attendant self-respect as a result of major changes in production and consumption patterns are less than enthusiastic about such changes. That is why the concept of a "just transition" from less sustainable to more sustainable patterns is increasingly seen as one of the central elements for any successful strategy for change. The concept of a "just transition" has been the starting point for a growing number of trade unions seeking to link social equity with equally desirable greater sustainability. The concepts supporting "just transition" are still being developed and refined. No one pretends they will always be easy to realize in practice. However, sustainable development in general and changing production and consumption patterns in particular will be easier to achieve if serious consideration is given to the mechanisms necessary for maximizing education, consensus and acceptance.

Workplace solutions

Workers are both producers and consumers. They are in a position to influence future production and consumption patterns positively. My experience is that there is a real willingness to engage in the debate on the part of workers, and many are already doing so. But in order to capitalize on the enormous potential for real and far-reaching change existing among workers around the world, it is necessary to provide optimal conditions. What are these conditions? At the risk of oversimplification, they include:

- the rights to participate and act collectively;
- the right to fair treatment; and
- the rights to be informed, and to education and training.

The parameters within which the above conditions are met are increasingly becoming the parameters against which companies and governments are being judged. This article is not the place to go into greater detail. But the major relevant initiatives, standards and conventions covering worker rights can be found in the ILO Conventions, the ILO Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy, the UN Global Compact, and the Revised OECD Guidelines for Multinational Enterprises.

Provided workers' rights are protected and their input genuinely welcomed and encouraged, we can expect that education and training in cleaner production and sustainable consumption concepts and practices will have an especially positive impact on the future of sustainability. Not only does the workplace offer a potentially very effective organizational setting for such education and training, but workers who are well-informed and well-trained will be able to put their skills and learning to use beyond the workplace, including making more informed consumer choices.

A vision for the future

Those who once thought that sustainable production and consumption were someone else's problem are hopefully becoming fewer in number. There is no top-down solution to the problems thrown up by current production and consumption patterns, and there is as yet no critical mass of bottom-up understanding about or support for sustainable production and consumption – though this seems to be changing, as explained above. The workplace can provide fertile ground for the development of a mutually beneficial and mutually reinforcing approach between employers and workers, upon whom success will largely depend. A joint employer/union approach to more sustainable production and consumption issues can have a number of direct and indirect benefits for both employers and workers. These include:

For employers

- wide and informed support for increasing efficiency through the reduction of both natural resources input and waste creation;
- increased worker motivation, with its attendant benefits for production, workplace morale, reduced industrial strife and reduced worker turnover;
- timely warnings of potential problems, helping to avoid major negative consequences;
- a more positive company reputation, based on a demonstrated commitment to integration of the social, the environmental and the economic pillars of sustainable development.

For workers

- real and positive influence on the future (and future sustainability) of their workplaces and jobs;
- increased understanding of the links between the workplace, the local community and the broader world, and much greater appreciation of the impacts of employment activities beyond the company perimeter fence;
- the development of real and transferable skills and experience;
- greater job satisfaction.

These are not likely to be the only benefits, but they suffice to demonstrate the real advantages to be gained by a genuinely cooperative approach based on mutual respect and commitment.

What can UNEP do?

The UNEP International Declaration on Cleaner Production was an important first step towards obtaining wider support for the concept of cleaner production. The Declaration now needs developing.

UNEP should consider cooperating with other agencies and stakeholders to develop and/or refine "Indicators of Cleaner Production and Consumption" (Icepacks) against which current and future performance can be measured. Such indicators would be useful to UNEP and to governments, companies and investors generally, all of whom require indicators against which to measure both risk and performance and to identify benchmarks and trends.

In the past there has been good cooperation between UNEP and the International Labour Organisation (ILO). Given the strong social, environmental and economic aspects of production and consumption patterns, and the likely impacts on workers of changing them, this cooperation should be strengthened.

UNEP should consider developing an initiative (perhaps together with the ILO and OECD) on the structural barriers to more sustainable consumption. This might be done by adopting a "scenarios" approach to the question.

UNEP should also seek to strengthen cooperation with the socially responsible and ethical investment community. It is important to demonstrate that sustainable production and consumption practices can be real contributors to the triple bottom line commitments of companies and their institutional investors, and to those who have yet to make such a commitment.

UNEP should consider inviting submissions from companies and trade unions of examples of cooperation to achieve cleaner production improvements and disseminate such examples on the UNEP web site.

UNEP should work with the Global Reporting Initiative to ensure that, as this initiative develops, it takes adequately into account the reporting of contributions to cleaner production.

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Sustainable consumption and production patterns: elements and challenges

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Agenda 21 identified unsustainable consumption and production patterns, especially in developed countries, as the major cause of continued deterioration of the global environment. A majority of problems stem from developed countries, but the most severe impacts are felt in the world's poorest regions. In today's global markets much of the social and environmental impact of primary production will increasingly be felt in developing countries.

In both developed and developing countries short-term economic considerations and shortcomings in market signals often hinder sustainable development. It is vital to push for integrated decision-making at all levels, based on precaution and taking into account long-term perspectives for maintaining functioning ecosystems to support further economic and social development. Sustainable development requires that production and consumption be adjusted to ecosystems' carrying capacity and contribute to greater human well-being.

The key challenge is to decouple environmental degradation from increased production and economic growth through addressing both supply and demand, with a focus on the most serious environmental challenges. Decoupling occurs when the growth rate of environmental degradation is less than the economic growth rate (e.g. as has happened in the case of SO_2 emissions).

Decoupling requires integration of the economic, social and environmental aspects of sustainability, and vice versa. It implies adjusting to changes in the quality of economic growth, as well as changes in existing consumption patterns and the lifestyles of developed countries. Well-managed, this is not a threat to jobs nor does it mean deterioration of quality of life. It will actually make possible economic growth, the creation of new business opportunities and promotion of human well-being in industrialised and developing countries. A political discussion is needed concerning what we understand by well-being, and about our values and lifestyles, in order to comprehend better the driving forces of consumption.

It is also important to develop coherent and coordinated environmentally related product policy (or integrated product policy, IPP). The challenge for governments is to provide efficient product regulation, and to motivate all the actors involved by creating incentives to voluntarily improve environmental performance above the level based on regulation. Addressing the pricing of products and the internalization of externalities, improving the environmental quality of products and promoting "green demand" by consumers are central themes of this policy, along with increased focus on the function of products (including services, product service systems or leasing). The product policy also satisfies the strong consumer demands of health and safety.

An important tool in this context is promotion of eco-efficiency. To enhance global equity, eco-efficient practices as well as product policy should offer developing countries ways to "leapfrog" from traditional polluting to more technologically advanced production – and to environmentally viable economic growth that takes account of the poor and uses natural resources sustainably. They should also offer possibilities for a good working environment, including equal occupational rights and opportunities, health and safety in the workplace, employee involvement, and lifelong learning.

Goals and priorities

Given that sustainable development cannot be achieved without fundamental changes in the ways societies produce and consume, concrete progress in this area is crucial for a successful outcome of the WSSD. Such progress should be pursued by all countries, with developed countries taking the lead. Moving the global economy onto a more socially responsible and resource productive path will provide benefits to society, the environment and the economy in every country.

To strengthen the ongoing work on sustainable consumption and production patterns, there is a need to establish a new, focused work programme for the coming decade with medium and short-term goals. This should lead to strengthened efforts to speed up implementation of agreed commitments so as to achieve measurable results, as well as to prioritize and focus on key areas.

The European Union has identified actions that could contribute to achievement of sustainable production and consumption patterns at different levels. These actions would need to be carried out by governments, other authorities, the private sector and civil society:

- provide adequate market structures supportive of sustainable development; enhance corporate responsibility and further develop general guidelines for sustainable development reporting; and promote international standardization of environmental reporting;
- encourage authorities at all levels to apply environmental and social considerations in decision making processes, including national investments in infrastructure, business development and public procurement, and training of relevant authorities;
- promote the role of governments, including their responsibility for ensuring adequate regulation, inspection and provision of essential services as a basis for sustainable development;
- use economic instruments and market incentives, including policies to internalize external costs through fiscal instruments, as well as market mechanisms;
- develop incentive and support programmes for cleaner production linked to state-financed loans, venture capital and like programmes for regional and business development;

- achieve a four-fold increase in energy and resource efficiency in developed countries by 2012;
- progressively eliminate environmentally harmful, trade-distorting subsidies that encourage unsustainable consumption and production patterns and inefficient use of natural resources;
- establish and support national and regional cleaner production centres to assist enterprises, especially SMEs, in identifying, acquiring, adapting and integrating technologies that improve productivity, reduce pollution and waste generation, and conserve natural resources;
- integrate environmental considerations into the national innovation system, and encourage industry and publicly funded research and development institutions to engage in strategic alliances to enhance research and development, in order to achieve cleaner production technologies and accelerate the commercialization and diffusion of those technologies;
- encourage all sectors to adopt voluntary initiatives and codes of conduct including certification, such as ISO 14 000 and other environmental management standards;
- encourage/promote development of certification and similar mechanisms/initiatives directed at industry, which embrace ecological as well as social dimensions;
- promote eco-design, eco-labelling and other transparent, verifiable, non-misleading and non-discriminatory consumer information tools to provide information at all stages of the product chain, ensuring that they are not used as disguised trade barriers, and engage the media in promoting sustainable consumption and production;
- assist small and medium-sized companies, through information and training programmes, to take advantage of the business opportunities arising from increasing consumer awareness of sustainable consumption;
- develop and disseminate renewable energy technologies to increase the share of renewable energy in energy production and consumption and accelerate the development, diffusion and use of energy-efficient technologies;
- raise consumer awareness of sustainable consumption and production, taking into account regional, cultural and ethical values in carrying out sustainable development initiatives;
- promote workplace-based partnerships, including training and education programmes that engage workers and employers in joint actions for sustainable development;
- promote specific programmes on sustainable development at the workplace, and link their performance to local, national and international sustainable development goals through well-integrated mechanisms;
- promote investments in the development of multimodal mass public transport systems, with technical and financial assistance for developing countries and economies in transition;
- implement transport strategies that reflect specific national and local conditions and take into account all forms of mobility (so as to improve the affordability, efficiency and convenience of transportation as well as improving environmental performance) and that improve reduction of greenhouse gasses, urban air quality and public health, including through environmentally friendly vehicles and cleaner fuels;
- encourage the role of governments at all levels in promoting eco-efficiency and sustainable lifestyles in infrastructure planning, construction and building, land use and city planning, public procurement, and training for all concerned stakeholders;
- promote waste prevention by encouraging production of reusable consumer goods and promoting use of renewable raw materials for production of consumer goods. Promote production of goods that are easily recoverable after consumption. Promote and provide international support for waste prevention, reuse, recycling and safe disposal and cleaner urban waste handling systems that generate income opportunities;
- promote rapid ratification and implementation of international instruments on chemicals, including the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Rotterdam Convention on Prior Informed Consent Procedures for Certain Hazardous Chemicals and Pesticides in International Trade, and the Stockholm Convention on Persistent Organic Pollutants, as well as related amendments;
- promote an environmentally related product policy to decrease environmental impacts through the whole life cycle of products, including the impacts of chemicals in products, and the use of natural resources and energy, using a balanced mix of instruments, with participation of all relevant stakeholders;
- endorse development of a strategic approach to international chemicals management and the IFCS Bahia Declaration on Chemical Safety and priorities for action beyond 2000, as the foundation for this approach by 2005; urge the active engagement of the major agencies responsible for funding and delivery of international development cooperation and other relevant actors; and call upon all governments and other relevant actors to take immediate action to implement the identified priorities;
- improve technical and financial assistance to developing countries incorporating chemical safety issues in development agendas; support capacity building and knowledge and technology transfer for environmentally sound management of chemicals and hazardous waste, especially in developing countries; encourage partnerships regarding concrete actions with industry to make operational the multilateral enironmental agreements (MEAs) and any other relevant international agreements on sound management of chemicals and hazardous waste;
- promote capacity building and transfer of technology for developing countries and economies in transition with respect to energy efficiency and energy conservation, and enable them to benefit from the Clean Development and Joint Implementation mechanisms of the Kyoto Protocol, while mitigating climate change and promoting sustainable development.

Promoting a life-cycle approach

The UNEP/SETAC Life Cycle Initiative, launched at the opening of CP7, furthers cleaner production and sustainable consumption by looking at the whole life cycle of a product, service, etc. from a strategic and practical perspective.

At the recent World Summit on Sustainable Development, the need to change production and consumption patterns was high on the agenda. Life-cycle thinking is the key to bringing about such change, and life-cycle approaches provide people and groups from all walks of life with the means to do so.

Life-cycle thinking is a way to address environmental issues and opportunities holistically, and to evaluate or design product service systems with the goal of reducing potential environmental impacts over an entire life cycle. The impacts of all life-cycle stages need to be considered in order to take informed decisions concerning product development, policies and management strategies aimed at changing consumption patterns.

The concept of life-cycle thinking is essential to achieving sustainable development. It can involve various life-cycle approaches such as life-cycle assessment (LCA), design for environment, life-cycle management, product service systems and integrated product policy. (All of these except LCA are "triple bottom line" tools incorporating social, economic and environmental issues.)

SETAC[1] defines *life-cycle assessment (LCA)* as "an objective process to evaluate the environmental burdens associated with a product, process, or activity by identifying energy and materials used and wastes released to the environment, and to evaluate and implement opportunities to affect environmental improvements."

Design for environment (DfE) is the systematic integration of environmental and social considerations into product and process design.

SETAC defines *life-cycle management* as "an integrated framework of concepts, techniques and procedures to address environmental, economic, technological and social aspects of products and organizations to achieve continuous environmental improvement from a life-cycle perspective."

UNEP defines *product service systems (PSS)* as a marketable mix of products and services that are jointly capable of fulfilling a client's need – with less environmental impact. UNEP DTIE recently published a booklet containing PSS case studies.[2]

Integrated product policy (IPP), a concept developed by the European Commission, involves working to stimulate each part of each individual phase of a product or service's life cycle – from extraction of natural resources through design, manufacture, assembly, marketing, distribution, sale and use to eventual disposal as waste – in order to improve environmental performance.

Structural changes in production systems have been occurring world-wide. As a result of globalization, there are clear indications that consumer tastes and habits are changing and converging. While production has become more efficient, however, consumption of goods and services has also increased. Life-cycle tools provide a basic support for making these trends visible to consumers and producers.

Many developed countries are relatively advanced with respect to cleaner production, but in the last decade have witnessed "rebound effects," in which improvements in efficiency are offset by increased consumption (efficiency improvements may even stimulate consumption). The result is that the total effect of these improvements on both society and the environment is minimal.[3] Rebound effects can be addressed by changing consumption patterns.

Individual consumers and consumer organizations have demonstrated their interest in the "world behind the product". That means more than the environmental burden of a product. Consumers now often ask about social considera-

Launch of the Life Cycle Initiative

At the opening of UNEP's Seventh High-level Seminar on Cleaner Production (CP7), Klaus Toepfer, UNEP's Executive Director, and Lorraine Maltby, President of the World Council of the Society of Environmental Toxicology and Chemistry (SETAC), launched the Life Cycle Initiative, a joint effort by the two organizations. Its mission is to "develop and disseminate practical tools for evaluating the opportunities, risks and trade-offs associated with products over their whole life cycle."

The impetus for this initiative was the Malmö Declaration of 31 May 2000, in which environment ministers at the first Global Ministerial Environment Forum advocated "development of cleaner and more resource efficient technologies for a life-cycle economy." The Malmö Declaration in turn followed the 1999 revision of the UN Guidelines for Consumer Protection, whose new Section G includes a call for governments to "encourage the design, development and use of products and services that are safe and energy and resource efficient, considering their full life-cycle impacts."

UNEP's 7th International High-level Seminar on Cleaner Production
Prague, Czech Republic, April 29-30, 2002

The Life Cycle Initiative links key themes of the recent World Summit for Sustainable Development, such as good governance, protection of consumer interests, dissemination of best practices, business opportunities, poverty alleviation, globalization, multi-stakeholder partnerships, and the Global Reporting Initiative and Global Compact.

The initiative aims to foster life-cycle thinking world-wide through development of an international life-cycle management framework, project-specific activities, and databases of best available methods and data concerning life-cycle assessment (LCA).

LCA tools are increasingly being used by industry and government to estimate the true impacts of products and services. Ms. Maltby noted in her keynote address that "Consideration of pollution problem shifting [e.g. when new technology reduces a given factory's air emissions but these emissions are increased at the nearest power plant] is at the heart of life-cycle thinking."

Mr. Toepfer emphasized that the challenge is to "change consumption practices in richer countries while bringing new tools to the table. The Life Cycle Initiative will ultimately help tackle poverty and ensure a safe and secure environment for long-term sustainable development."

He concluded by emphasizing that the initiative would be driven by the implementation and dissemination of life-cycle thinking and approaches, with a key role for demonstration studies and training modules for smaller enterprises, particularly in developing countries and countries with economies in transition.

tions; they want to know how and where a product has been produced, for example. The average consumer is not interested in detailed findings, but information at a glance, e.g. on a label.

Consumer organizations increasingly include environmental issues among their criteria for product comparison. Eco-labelling and environmental product declarations, used in combination with other tools, are one strategy for providing information about the product to consumers. There is a need for consistent product criteria and information about the message conveyed through eco-labels and product declarations.

However, eco-labelling and product declarations should not hinder trade or severely skew the market. Rather, eco-labelling should be supported, developed and applied to provide new business opportunities. The Life Cycle Initiative, with its International Life Cycle Panel, could prove an appropriate forum for making eco-labelling and environmental product declarations an efficient means of business-to-business and business-to-consumer communication. It is vital to provide consumers with a consistent set of signals. The more they rely on LCA or other life-cycle tools, the more business, government and consumer organizations will share a common language.

The Life Cycle Initiative aims to provide a strategic framework to help government and business use life-cycle tools.

Governments set the framework and conditions for production and consumption patterns. Government initiatives to stimulate markets for greener products will not only secure and strengthen the position of the industrial and service sectors on regional and global markets, but also assure overall environmental benefits to society, balanced with economic and social aspects. This is what the European Commission seeks to do through IPP.

For business and industry, the challenge is to secure and increase market share, to protect and expand business values, including shareholder value, and to achieve competitive advantage that goes beyond legal compliance and short-term cost savings. Incorporating life-cycle and sustainability management will improve image and brand value for world market players as well as for smaller suppliers and producers. By integrating the life-cycle perspective into overall management and moving product and process development in a more sustainable direction, business can harvest benefits to environmental, occupational health and safety, risk and quality management, as well

Life-cycle assessment and social impact

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While life-cycle assessment (LCA) has been making enormous progress in providing data, management tools, software and methodologies, allowing for more precise measurement, a number of issues have yet to be addressed. Many of these issues concern world-wide dissemination of LCA methods and how these methods are adapted for developing countries through building databases and customizing management tools to suit local demands.

Addressing such issues can be carried out within an existing structure, such as that of the National Cleaner Production Centres, but it also requires investments that must be shared among industry, government and international agencies.

According to Walter Kloepffer, editor of the *International Journal of Life-Cycle Assessment*, sustainability is the ultimate aim of product development. LCA initiatives have focused on measuring the economic and environmental impacts of a product over its entire lifetime, but sustainability also implies a human factor that is more difficult to assess. This is a gap in the current methodology for evaluating the impact of the product's life-cycle.

While no methodology yet exists for accurately assessing the social impact of a sustainable development project, a number of academic works and publications in recent years have examined the development of such a methodology. For instance, Robert Chambers and Gordon Conway, authors of *Sustainable Rural Livelihoods* (1992), define a "sustainable livelihood" as one integrating justice, capability and sustainability.

To quantify sustainable livelihood, Ian Scoones of the University of Sussex's Institute for Development Studies has proposed a method involving five types of capital: natural, financial, human, social and physical. Using this method, in cooperation with a community, the degree to which a given project has affected the community's access to any of these types of capital can be measured.

Natura, a Brazilian cosmetics company, recently supported a project in a Brazilian ecosystem in which such a methodology was used to assess the affect of a carbon sequestration project on the communities involved. It was possible through interviews with local people to create a diagnostic of the project's impact. As a very preliminary undertaking, this may serve as a basis for developing social life-cycle indicators. These indicators may be described as follows:

- *Natural capital:* reduction in levels of deforestation and maintenance of stocks of animals and fish;
- *Financial capital:* increased access to credit;
- *Human capital:* level of literacy;
- *Social capital:* level of participation in decision-making processes;
- *Physical capital:* existence of roads, hospitals and other infrastructure.

Since Natura was founded 33 years ago, one of its guiding principles has been to rely on the use of natural raw materials. Three years ago an in-depth assessment of the company's values and beliefs took us to a new development platform: sustainable use of Brazilian biodiversity, drawing on the knowledge of the traditional indigenous populations.

In developing a line of products called Ekos (from *ekó*, meaning "life" in the Tupi-Guarani language), Natura sought to conserve and disseminate the Brazilian natural, cultural and social heritage while creating sustainable wealth by buying plant extracts and natural oils from communities or reserves, in conjunction with raw material suppliers.

To assure sustainable exploration and handling of flora, Natura established a certification programme to audit the entire supply chain, taking into account environmental, social and economic criteria. Ingredients obtained through extraction are measured using a set of principles and criteria established by the Forest Stewardship Council. Ingredients obtained through cultivation must abide by the principles and criteria of the Conservation Agriculture Network.

Challenges that arose during the project include:

- a supplier mentality of working "just-in-time";
- definitions regarding access to and use of genetic information and compliance with regulations;
- remuneration of traditional knowledge;
- the ability to create economic sustainability.

Because product success and product life-cycle duration varied so much from product to product, the variable economic sustainability of communities/reserves from which ingredients were procured became an issue. Hence, the research and development approach is being redirected and the product development cycle is now initiated in cooperation with the communities/reserves involved. The potential for multiple ingredients (reducing dependence on a single product or service) would diversify communities' sources of income, as would activities such as eco-tourism, fishing and woodcraft.

As this description shows, LCA in such a case is quite complex and includes elements that cannot be measured using conventional tools. To obtain a holistic view of the chain of relationships throughout the life cycle, LCA must integrate the social aspects of development, preservation of the culture in question, and traditional knowledge.

as developing and applying cleaner process and product options.

There is a particular need to make life-cycle tools easily obtainable in developing countries, where small and medium-sized enterprises (SMEs) could especially benefit. More generally, to assure a global shift towards sustainability, developing countries need to be able to "leapfrog" with more sustainable technologies, methodologies and data. Yet most developing countries lack the needed resources.

A gap exists between developed and developing countries regarding the application and perception of life-cycle thinking in general and LCA in particular. LCA has not been adapted to the needs of stakeholders in developing countries. Few databases accurately reflect the needs of SMEs in many regions of the world. And yet developed countries' trade with developing countries is increasing, as is trade within the developing world. Developing countries provide raw materials for the supply chain of industry in developed countries. For these and other reasons, the requirements for environmental considerations should be the same in North and South.

There are also differences between the application of life-cycle approaches in North and South. For example:

- Developing countries tend to see life-cycle tools more as a way of thinking, while industrialized countries stress that they are "scientific" tools.
- Industrialized countries have more experience than developing countries in the end-use of life-cycle tools. Green government purchasing, eco-labelling, sectional environmental databases and sectoral environmental benchmarking are as yet limited to industrialized countries.
- In developing countries comparison of competing products is thought to be an application of LCA, whereas in industrialized countries this practice is seldom mentioned and the focus is on product development, measuring the performance of planned alternatives against existing products.
- Clients and consumers are often more involved in industrialized countries.
- Some developing countries are optimistic about the future use of LCA and other life-cycle approaches, but seek clearer methodology adapted to their needs, synergies with other instruments and broad dissemination of these approaches.

Life-cycle approaches will help orient consumption in a more sustainable direction by offering better information for purchasing, transport systems and energy sources to guide consumer behaviour. This offers a platform for multi-stakeholder dialogue and public involvement with industries and governments in political and practical initiatives, ranging from Local Agenda 21 to national and international strategies for sustainable development.

To summarize, life-cycle approaches can be advantageous by:

- providing reliable information in an accessible format, improving communication and contributing to awareness raising and more informed decisions by consumers, governments and industry;
- preparing industry for increasingly aware consumers by facilitating more efficient communication strategies and stakeholder involvement, to be implemented by both the public and the private sector;
- supporting good business practices – life-cycle approaches assist stakeholders in "thinking out of the box" and can thereby provide an important contribution to "leapfrogging" both within and among regions (North and South), countries and industries;
- contributing to continuous improvement – the adaptation of currently existing methods to the triple bottom line fosters a truly holistic way of thinking and thus creates efficient structures for improvement;
- ensuring global applicability and dissemination – efficient implementation of the life-cycle approach should optimize usability and prevent duplication of work.

Notes

1. Society of Environmental Toxicology and Chemistry (see *www.sectac.org/lca*).
2. Reviewed on page 105.
3. E. Matthews et al., *The Weight of Nations – Material Outflows from Industrial Economies*, World Resources Institute, 2000. For an examination of the rebound effect in relation to energy (and improvements in energy efficiency), see L.A. Greening, D.L. Green and C. Difiglio, Energy efficiency and consumption – the rebound effect, *Energy Policy* 286/7, 2000. Also see F. Pearce, Consuming Myths, *New Scientist* 159/2150, 1998.

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Cleaner production in the context of sustainable development

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Summary

The success of cleaner production as a sustainable development strategy should be measured in the context of environmental, economic and social impacts. CP implementation world-wide has been offset by economic growth and increased consumption. The WTO, as well as the World Bank and other lending institutions, have made the development crisis worse and are responsible for increased environmental degradation. There has been a failure to monitor and regulate transnational corporations. Much more needs to be done to enforce changes in TNCs' policies, and to promote greater social and environmental responsibility.

Résumé

Le succès de la production plus propre en tant que stratégie de développement durable doit être évalué en fonction de ses impacts environnementaux, économiques et sociaux. La mise en œuvre de la production plus propre dans le monde a été contrebalancée par la croissance économique et la progression de la consommation. L'OMC, ainsi que la Banque mondiale et d'autres institutions de prêt, ont intensifié la crise du développement et sont responsables d'une aggravation de la dégradation de l'environnement. Rien n'a été fait pour surveiller et réglementer les entreprises transnationales. Il y a encore beaucoup à faire pour les amener à modifier leurs politiques et pour promouvoir une plus grande responsabilité sociale et environnementale.

Resumen

El éxito de la producción más limpia como estrategia de desarrollo sustentable debe medirse en función de impactos ambientales, económicos y sociales. La implementación global de producción más limpia se vio contrarrestada por un mayor crecimiento económico y aumento del consumo. La OMC (WTO), el Banco Mundial y otras entidades crediticias empeoraron la crisis generada por el desarrollo y son responsables de la creciente degradación ambiental. El monitoreo y la regulación de corporaciones transnacionales fue un fracaso. Aún queda mucho por hacer para lograr modificar las políticas de corporaciones transnacionales y promover una mayor responsabilidad social y ambiental.

We all agree that sustainable development has three dimensions: environmental, economic and social. Cleaner production needs to be assessed with respect to all three dimensions: Has it resulted in less environmental impact? Has it contributed to equitable economic benefits for all people in the North and South? Has it brought about societal benefits? The key word here is *measurement*. How do we measure these gains?

Environmental measurements

To achieve sustainable development, fundamental changes need to be made in the ways societies produce and consume. A number of approaches have been developed (e.g. cleaner production, pollution prevention, factor 4/factor 10, decoupling of economic growth from environmental impacts). To assess their success, it is essential to have appropriate measurements.

The study of materials flows is one such concrete measurement. The World Resources Institute and its partner institutes conducted a study of five industrial economies (Austria, Germany, Japan, the Netherlands and the United States). According to its report, total output of wastes and pollutants in these five countries had increased by as much as 28% since 1975 despite more efficient natural resources use. The report also showed that between one-half and three-quarters of the resource inputs used in these five countries are returned to the environment as waste within one year; this is attributed to "the tremendous scale of economic growth and consumer choices that favour energy and material intensive lifestyles".[1]

Similarly, an assessment of sustainable development progress by the UN Economic Commission for Europe unequivocally states that although progress has been made in improving eco-efficiency in the ECE region, these gains have been offset by overall increases in consumption.[2]

It is not enough to clean up production. It is also crucial to pay attention to the extraction and disposal phases of the materials cycle and to increasing consumption levels. While much attention has been paid to cleaning up the production phase, which is relatively well-regulated, the extraction, disposal and consumption phases have not been adequately addressed. Cleaner production and the Life Cycle Initiative (LCI) do not begin at the factory where a product is being manufactured, but at the point where raw materials are extracted. They continue right through to use and disposal of the finished product.

The challenge is how to measure environmental impacts from raw materials extraction through to consumption and disposal. This challenge is quite complex, as the main actors are transnational corporations. TNCs account for the largest share of global economic activity and are the main entities responsible for global environmental impacts.

TNCs are by and large a law unto themselves. The post-Rio and post-Uruguay Round era has seen them acquire more economic clout, more economic space and less regulatory constraints on their operations.

Of the world's 100 largest economic entities in 2000, 51 were TNCs and only 49 were governments. By 2001, 54 were corporations and 46 were governments.[3] Based on these statistics, Royal Dutch Shell's revenue is greater than Venezuela's GDP, WalMart is bigger than Indonesia, and General Motors is roughly the same size as Ireland, New Zealand and Hungary combined. Three-quarters of all TNCs are based in North America, Western Europe and Japan; 99 of the 100 largest TNCs are based in industrialized countries.[4]

If we drew up an environmental balance sheet of TNC activities, this is what it would look like:

- 122 TNCs account for 80% of all CO_2 emissions. The oil produced by five private global corporations (ExxonMobil, BP Amoco, Shell, Chevron and Texaco) contributes some 10% of the world's carbon emissions. Greenhouse gas emissions from the fuel they produce exceed total GHG emissions from Central America, South America and Africa combined![5]
- Production and use of ozone-destroying CFCs and related compounds are virtually exclusively controlled by TNCs.
- The key mining industries are also controlled by TNCs.
- 80% of agricultural land world-wide is cultivated for export crops by TNCs.
- Most of the world's chlorine (the basis of some of the most toxic chemicals, including PCBs, DDT and dioxins) is manufactured by TNCs.
- The main transmitters of environmentally unsound production systems, hazardous materials and products to the Third World are TNCs.
- TNCs dominate the trade in (and in many cases also the extraction or exploitation of) natural resources and commodities that contribute to depletion or degradation of forests and water and marine resources, as well as toxic waste and unsafe

products.

- The culture of unsustainable consumption is promoted by TNCs through aggressive advertising and product promotion.

These companies are responsible for far more greenhouse gas emissions than most countries. More CO_2 is emitted by use of oil produced by Shell alone than by most countries in the world, including Canada, Brazil, Mexico, France, Australia and Spain. BP Amoco's production accounts for emissions surpassing those of the UK; ExxonMobil's emissions are the equivalent of some 80% of those of all of Africa or South America.

The Intergovernmental Panel on Climate Change (IPCC) estimates that to stabilize CO_2 concentrations at current levels we need to reduce carbon emissions by some 60%. There is no way to do this without massive reduction of fossil fuel consumption and development of alternative energy sources. If fully exploited, proven oil and gas reserves would far exceed the Earth's capacity to absorb carbon emissions. In other words, it is impossible to burn even the fossil fuels we already have safely, let alone those that remain undiscovered.

The oil industry has profound impacts not only on the global climate, but also on local ecology and the struggle for democracy. New exploration and oil or gas pipelines threaten the survival of indigenous peoples in the Amazon basin, South-East Asia, North America and elsewhere. These peoples and their supporters have been actively resisting the encroachment of oil and gas exploitation.

The World Bank and other international financial institutions contribute to global warming. These institutions lend millions of dollars per year for new fossil fuel projects. Amoco, ExxonMobil and Chevron, among other western companies, have been enriched by projects supported by these institutions. World Bank projects financed since 1992 will produce 37.9 billion tonnes of carbon – over a year's worth of the world's total carbon emissions. US export credit and insurance agencies, the Export Import Bank and the Overseas Private Investment Corporation have underwritten $23.2 billion in financing for fossil fuel projects world-wide that will emit 25.5 billion tonnes of CO_2 over their lifetimes.

The largest oil companies have not used their power to develop renewable energy significantly. In 1973 geothermal, wind and solar accounted for 0.1% of world energy supply. In 1996 renewables accounted for a mere 0.4%. During the same period oil declined in terms of dominance of fuel supply, from 44.9% to 35.3%, though it remains the biggest source. This decline was largely offset by use of natural gas, which contributes equally to global warming, and by nuclear power.

There has been a failure to monitor and regulate TNCs internationally. Instead, there have been moves to increase their rights and global access through WTO agreements. No less daunting is the need to change the policies of international financial institutions and the WTO.

Economic measurements

The greatest failure post-Rio has been lack of financial flows to developing countries. The UN members have agreed that industrialized countries should contribute 0.7% of their GNP to official development assistance (ODA). Instead of coming closer to this target, since the Earth Summit most of these countries have fallen farther and farther behind. Only five (Denmark, Luxembourg, the Netherlands, Norway and Sweden) met or exceeded the 0.7% aid target in 2000. Most of the least developed countries (LDCs) suffered a decline in ODA of at least 25%; seven countries in this group, all African, saw ODA reduced by more than 50%. The share of ODA targeted for sustainable development of oceans and seas, protection of the atmosphere, sustainable agriculture and combating deforestation fell from 25% in 1996 to 17% in 1999.[6]

Structural adjustment polices and restrictions have resulted in an immense lack of resources or "economic space" in many developing countries. Environmental regulations have been relaxed to compete for foreign direct investment. In the 1980s and 1990s the IMF imposed structural adjustment programmes on over 70 countries. These polices have required 36 countries in Sub-Saharan Africa, where more than half the population lives in absolute poverty, to decrease domestic consumption and shift scarce resources to production of cash crops for export; state-owned companies and many state services have been privatized, and health and education expenditures have been cut and restructured. The absolute number of people living in poverty rose in the 1990s in Eastern Europe, South Asia, Latin America and the Caribbean, and Sub-Saharan Africa – all of which were subject to adjustment programmes.

In 2000 a bipartisan US Congressional panel (the Meltzer Commission) found that World Bank Group and IMF failures could be traced to "overlapping missions, ineffectiveness, corruption and waste of resources, and failure to develop successful regional programmes in agriculture, forestry, environment and health care" among other problems. Every year the World Bank awards some 40,000 contracts to private firms. The US Department of the Treasury has calculated that for every dollar the US contributes to international development banks, US corporations receive more than double that amount in bank-financed procurement contracts. At the same time, World Bank projects in the poorest countries have an astounding 65-70 % failure rate.

Since it was created in 1995, the WTO has ruled that every environmental policy it has reviewed is an illegal trade barrier that must be eliminated or changed. With one exception, it has also ruled against every health or food safety law it has reviewed. Countries whose laws have been declared trade barriers, or that were merely threatened with WTO action, have eliminated or watered down their policies to meet WTO requirements.

There is little improvement in technology and no real will to change harmful production methods. Indeed, a study of trends in the global mining industry states: "In the South, liberalization took a different form: liberalization of mining laws, derestriction and deregulation. The common trend in many Third World countries is the removal of most barriers and instruments previously used by governments in the preservation, development and utilisation of their mineral resources. Around 70 countries in Latin America, Africa and Asia Pacific are now fully liberalizing their mining laws and implementing deregulation in a wide range of areas, including land rights and mineral rights, taxation, environmental protection, in order to attract foreign mining investors."[7]

The promised technology transfer to the South has not taken place. Instead new obstacles have emerged, such as enhanced intellectual property rights (IPR) protection. Harmful technologies continue to be exported to the South. Waste in the guise of recyclable material from the North has been sent to the South. One only has to visit the website of the Commission on Human Rights to find hard evidence of the illegal flow of toxic waste from industrialized to developing countries.[8]

Since Rio there has been little or no progress in facilitating the transfer of environmentally sound technology (EST) to the South. Instead the international intellectual property rights regime has become stricter, especially through the TRIPs Agreement in the WTO. Evidence is also emerging that the IPR regime can keep developing countries from having effective access to EST.

Small and medium-sized industries in the South face formidable challenges to their survival, let alone to implementing cleaner production policies, when pitted against the combined might of the Northern countries, their TNCs, and biased implementation of the economic polices of the Bretton Woods institutions and the WTO.

Social measurements

Poverty is still a major problem in developing countries. Many are worse off today than they were 30 years ago. The development dimension has not been successfully integrated in the substance of cleaner production.

In this context we need to consider the question of consumption. Levels of consumption are a good way to measure progress in natural resource savings. Household consumption world-wide increased by 68% between 1980 and 1998. The working age population in developing countries will increase from 3 billion in 2000 to 4 billion in 2025.[9] These figures indicate the potential for an explosion in consumption in the North and by elites in the South.

Expansion of global advertising has been phenomenal. Advertising has won a key psychological victory: it has made people believe its dominant message that life's problems can be solved by buying things. The problem is that the "American dream" depends on enormous and continuous inputs of those commodities whose production is the most damaging to the Earth: energy, chemicals, metals and paper.

Cleaner production and the Life Cycle Initiative in themselves are not the solution. The unsustainable consumption patterns of the wealthy and the middle class also need to be addressed. A global survey by UNEP and Consumers International reveals slow progress by governments in implementing the sustainable consumption provisions of the UN Guidelines for Consumer Protection. 38% of the governments responding were not aware of the Guidelines' existence. Some of the largest resource consuming countries (including the US) did not respond at all.[10]

The strongest economies have the greatest responsibility for easing consumption patterns. Take CO_2 emissions from cars and light trucks in the US. That country accounts for 25% of world CO_2 emissions. In the US transportation accounts for one-third of all CO_2 emissions, of which 62% is from cars and light trucks. Thus these vehicles represent about 20% of US carbon emissions, or about 5% of the world total. If the US personal car and truck fleet were a country, it would rank fifth world-wide in terms of global warming emissions. The emissions from these sources nearly match those from all sources in Japan and exceed those of India and Germany, which rank fifth and sixth in the world in global warming emissions. Controlling CO_2 emissions from personal vehicles is key to addressing global warming.[11]

An analysis by Environmental Defense of the largest automakers in the US (General Motors, Ford, Daimler-Chrysler, Toyota and Honda) shows that between 1990 and 2000 the carbon burden of all these companies increased.[12] Vehicle design is the main reason for this increase. Once a vehicle is designed, that model will be produced more or less the same way, except for cosmetic changes, for four to six years and will be on the road for another 12 to 15 years.[13] On average a US citizen is responsible for emitting about 120 pounds of greenhouse gases per day, about twice as much as the average in other wealthy countries like France, Germany or Japan. With just 4% of the world's population, the US emits about one-quarter of the world's greenhouse gases. The average GHG emissions of one US citizen are equal to those of 25 Indians, 33 Pakistanis, 125 Bangladeshis or 500 Nepalese. And US energy consumption is still growing, largely as a result of more driving, bigger cars, bigger houses and appliances, and lack of efficiency measures by industry.

The challenges ahead

1. Hold TNCs accountable

Since TNCs dominate and use the largest share of the Earth's resources and enjoy the spoils of their power, they have to accept the greatest share of responsibility. They must promote development that meets basic human needs, and do so sustainably. Self-regulation has not worked: time and time again it has been shown to result in lawlessness and reckless behaviour by TNCs. The international regulatory regime needs to keep track and take stock of their activities. The international regulatory architecture must be strengthened in order to do this effectively. Multilateral environmental agreements (MEAs) bind only governments, but they should also hold TNCs accountable for their activities at home and abroad. National laws should require those financing TNCs' operations to impose obligations on them to implement cleaner production and promote sustainable consumption.

2. Track materials flows

Systems are not in place to track flows of natural resources from extraction, production, use and recycling to final disposal. While GDP measures economic development in dollars, materials flows can measure the impact of industrial activities on the environment. Flows of natural resources, goods, pollutants and wastes generated by an industrial economy could be a new way to measure countries' environmental performance. UNEP needs to develop databases and indicators that document materials flows through industrial economies and produce a global report card of their environmental performance. The goal is to develop new thinking and new management tools to help bring about the transition to more efficient and less environmentally harmful patterns of materials use in modern societies. We need tangible measurements of the progress made. Otherwise we will forever be immersed in the anecdotes and rhetoric of sustainability without hard evidence to support claims to success.

3. Reduce wasteful consumption

Governments, industry and civil society must jointly accept responsibility for convincing consumers to change their consumption patterns. The initiative taken by UNEP and Consumers International to survey implementation of the sustainable consumption provisions of the UN Guidelines for Consumer Protection is a step in the right direction. It is to be hoped that the results will be used to design programmes involving all stakeholders in a world-wide effort to address the consumption issue.

Changes in consumption patterns cannot be achieved when consumers are bombarded with conflicting messages. Advertising of harmful and unhealthy products needs to be curbed. Consumers' choices mainly depend on price and convenience. Therefore they need to be given incentives to choose environmentally friendly products, produce less household waste and take part in "reuse, reduce and recycle" campaigns. Cleaner production initiatives should also assess post-production consumption measures such as after sales service, repairs to household appliances, and responsibility for recycling or disposal of obsolete consumer products.

4. Improve international environmental governance

The process of globalization, with economic liberalization, has caused further environmental harm, increased the concentration of wealth and power in a handful of big corporations, and undermined the authority and autonomy of national governments. In fact, governments have been weakened, are failing their citizens, and are unable to govern effectively. International environmental governance is therefore a key issue. The UN system has been weakened by the growing power of the WTO, with its enforcement capability, and the IMF and World Bank with their ability to attach conditions to loans. There is also concern that the proliferation of MEAs is creating fragmentation, diffusion and overlap in governance structures.

National implementation is weak in many cases because of highly inadequate financial resources. UNEP's resources need to be enhanced for its voice within the UN system to be heard, so that it can effectively champion the cause of sustainable development (particularly its economic, social, developmental and equity aspects).[14] The UN system also needs to sufficiently integrate and collaborate in strengthening the capacity of developing countries, and to ensure adequate financing for developing countries to implement and achieve sustainable development.

Notes

1. World Resources Institute (2000) The Weight of Nations: Material Outflows from Industrial Economies (*www.wri.org/materials/weightofnations.html*).
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4. Corpwatch (2001) Corporate Globalization Fact Sheet (*www.corpwatch.org/press*).
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10. United Nations Environment Programme (UNEP) and Consumers International (2002) *Tracking Progress: Implementing Sustainable Consumption Policies.*
11. DeCico, J. and F. An (2002) Automakers' Corporate Carbon Burdens – Reframing Public Policy on Automobiles, Oil and Climate (*www.enviromentaldefense.org/pdf.cfm?*).
12. *www.environmentaldefense.org/article.cfm?ContentID+2222.*
13. Take, for example, Chrysler's Grand Cherokee jeep. The 1999 model, which reached 300,000 in annual sales, was consuming 5 million barrels of oil and emitting 1.9 million tonnes of CO_2 per year. These emissions correspond to 0.5 million metric tonnes of carbon.
14. Third World Network (2001)International Environmental Governance: Some Issues From a Developing Country Perspective (*www.twnside.org.sg*).

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Stakeholder perspectives: government

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Summary
Cleaner production (or pollution prevention) objectives need to be "mainstreamed" into overall governmental industrial and fiscal policies. A strong environmental regulatory regime also needs to be in place. Industry challenge programmes, educational initiatives and public-private partnerships are playing increasingly important roles. However, until fiscal policies are reformed so that market prices incorporate full environmental costs, strong regulations will be essential. It is time to move beyond a focus on reducing waste and emissions associated with industrial processes. Areas including product design, sustainable consumption and social impacts (e.g. "environmental justice") have been receiving increasing attention.

Résumé
Il est impératif d'intégrer les objectifs de production plus propre (ou de prévention de la pollution) dans les politiques industrielles et fiscales globales des gouvernements. Il faut également mettre en place un système de réglementation fort pour protéger l'environnement. Les programmes défis de l'industrie, les initiatives éducatives et les partenariats public-privé jouent un rôle de plus en plus important. Mais tant que les politiques fiscales n'auront pas été réformées pour intégrer la totalité des coûts environnementaux dans les prix du marché, des réglementations fortes seront indispensables. On ne peut plus se contenter de réduire les volumes de déchets et d'émissions produits par les procédés industriels : il faut maintenant aller plus loin. A cet égard, des aspects comme la conception des produits, la consommation durable et les impacts sociaux (par ex. l' " équité environnementale ") retiennent de plus en plus l'attention.

Resumen
Las políticas gubernamentales industriales y fiscales deben incorporar objetivos de producción más limpia (o prevención de polución). Asimismo se debe implantar un esquema regulatorio ambiental riguroso. Los programas de desarrollo industrial, las iniciativas educativas y las asociaciones entre entes públicos y privados juegan roles cada vez más preponderantes. Sin embargo, hasta tanto se modifiquen las políticas fiscales para que los precios de mercado incorporen todos los costos ambientales, es indispensable contar con normas estrictas. En esta época las propuestas para reducción de residuos y disminución de emisiones en procesos industriales son insuficientes. Temas tales como diseño industrial, consumo sustentable e impactos social (por ejemplo: " equidad ambiental ") cobran progresiva importancia.

This is a review of some of the many important initiatives governments and others have taken to promote pollution prevention and cleaner production, especially in North America.[1] It addresses three themes:

- Representatives of environmental agencies must "mainstream" cleaner production objectives into government-wide industrial and fiscal policies, so that they move from being the sole responsibility of corporate environment, health and safety managers to being squarely on the agenda of the CEO and Board of Directors.
- A strong environmental regulatory regime needs to be maintained. Although industry challenge programmes, educational measures and public-private partnerships have increasingly useful roles, it is clear that until we dramatically reform fiscal policies so as to incorporate full environmental costs into market prices, strong regulations will be required to stimulate action and avoid "free rider" problems.
- We need to continue learning how to expand the agenda and vision beyond a focus on reducing waste and emissions associated with industrial processes to include product design and sustainable consumption and social considerations, such as the growing emphasis on "environmental justice."

Partnerships

The premise underlying the first theme is that direct action by environmental regulators will only get us halfway to our long-term objectives. Businesses (and consumers) make environmental decisions in response to a complex and inter-related set of internal and external drivers, only some of which environmental agencies can influence. Governments, markets, the local community and the judiciary all create pressure for more (or less) improved environmental performance. In addition, the business case for going beyond regulatory compliance is not universal: different businesses will respond differently to the wide range of regulatory, economic and social pressures they each face. As a result, a strategy to stimulate innovative, environmentally appropriate production and consumption activities must deploy an array of incentives, including many that rely on non-regulatory and even non-governmental forces. We must therefore look to a variety of instruments to stimulate the non-governmental and private sectors to be partners in the sustainable production and consumption agenda.

Many of the initiatives developed around the world to promote pollution prevention rely on partnerships. The National Cleaner Production Centres, the UN-sponsored sectoral working groups, and the many regional, national and local pollution prevention roundtables in virtually every region of the world all rely on a partnership model.

Partnerships can work at all levels. For example, the Canadian Pollution Prevention Roundtable was developed in the mid 1990s in response to growing interest from industry, NGOs and governments at all levels in sharing information about how to promote and implement pollution prevention most effectively. Based on the National Pollution Prevention Roundtable in the United States and the European Roundtable on Cleaner Production, the Canadian Pollution Prevention Roundtable is co-chaired by a representative of the federal government and a member of the non-profit Canadian Centre for Pollution Prevention, with a steering committee representing industry, NGOs, and municipal and federal governments. The roundtable is a virtual organization of individuals who are interested in and committed to advancing pollution prevention. The Canadian Centre for Pollution Prevention looks after all ongoing communications and organization of events, which include regular meetings, fostering ongoing communications directly among members and through an e-mail list server.

In addition to our work at the national level, we are expanding our pollution prevention partnership efforts both upwards at the regional and international levels, and downwards to the local levels. At the regional level, the North American Commission for Environmental Co-operation (CEC) has supported the Capacity Building for Pollution Prevention project. This has provided a forum for the Pollution Prevention Roundtables in Mexico, the United States and Canada to meet regularly, exchange experiences and develop joint initiatives. And under the Summit of the Americas, all Ministers of the Environment are supporting the Roundtable of the Americas for Cleaner Production as an important aspect of their overall efforts to promote partnerships with industry and civil society throughout the Americas.

Internationally, one of the most important outcomes of the Sixth International High-level Seminar on Cleaner Production (CP6) and the International Pollution Prevention Summit in Montreal was the creation of the Pollution Prevention Worldwide Information Network (P2WIN). Operated by the Canadian Centre for Pollution Prevention, this network will provide a virtual meeting place for the many Pollution Prevention Roundtables, Cleaner Production Centres and sustainability networks world-wide.

Local level partnerships may be particularly effective ways of reaching out to small and medium-sized enterprises (SMEs). Smaller companies make up a large majority of businesses in Canada. However, since many SMEs do not have the resources readily available to invest in pollution prevention projects, they can be difficult to reach, mobilize or engage in environmental activities. The Toronto Region Sustainability Programme is an agreement between three levels of government (the Province of Ontario, the City of Toronto and Environment Canada). The non-profit Ontario Centre for Environmental Technology Advancement is contracted to run the project. It identifies businesses showing potential for pollution prevention, hires consultants to conduct pollution prevention audits of participating businesses, identifies problems and potential solutions, and facilitates access to financing to undertake pollution prevention projects.

EnviroClub is a similar concept, started by the federal Department of Environment in the Province of Quebec. Its objective is to help SMEs improve competitiveness and profitability through enhanced environmental performance. This programme shares with participating facilities the cost of an environmental audit aimed at identifying cost-effective pollution prevention opportunities. The programme has helped many SMEs identify and implement pollution prevention opportunities with valuable returns-on-investment that might otherwise have remained unrealized.

"High production-high volume" chemicals initiatives to categorize the toxicological characteristics of the thousands of substances in commerce represent another example of the potentially important role such partnerships can play.

Emerging experience also points to the potentially important role carefully structured public-private partnerships can play in stimulating "radical" innovations. Under the American Carrot Programme, for example, a consortium of regulatory agencies, NGOs and industrial representatives provides an annual challenge to industry in various sectors to develop a more energy or material efficient appliance of a designated type. The consortium widely publicizes the winning designs, helping stimulate considerable market pressure to support ongoing innovations in these products.

Canada and the United States, like many other countries, are exploring the most effective ways to design challenge programmes to try to encourage "beyond business as usual" cleaner production activities. Many of these initiatives explore issues such as:

- how to use regulatory and permitting regimes to provide incentives;
- whether and how to incorporate certified environmental management systems;
- how to ensure credibility through public involvement, public reporting, and effective performance verification mechanisms.

In Canada much of the work in this area builds on the suite of public-private challenge programmes developed in the 1990s to address such issues as energy efficiency (the Canadian Industry Programme for Energy Conservation, or CIPEC); smog (the federal-provincial Anti-Smog Action Plan, or ASAP); toxic emissions (the Accelerated Reduction/Elimination of Toxics programme, or ARET) and GHG emissions (the Voluntary Challenge and Registry, or VCR). These programmes have been insightful and are being improved upon to continue encouraging pollution prevention and significantly reduce the environmental impact of an even greater number of businesses in Canada.

Finally, information disclosure programmes represent an under-utilized mechanism for empowering non-governmental actors to create pressure for improved environmental performance. A recent US Toxics Release Inventory (TRI) study concludes that the most important impacts of the TRI have flowed from its use by third parties to target the most egregious polluters for direct community action ("environmental blacklisting") and to pressure government to focus on tightening standards and enforcing existing ones against those facilities reporting the highest emissions (Fung and O'Rourke, 2000).

Following the lead of the US Environmental Defense Fund and Friends of the Earth, United Kingdom, we have recently expanded on the basic pollutant release and transfer registry model in Canada. Help was given a coalition of environmental NGOs in developing an internet-based system using data from our National Pollutant Release Inventory. Users can identify local releases and access easily understandable information about potential environmental and health impacts.

The importance of continued "smart" regulations

While exploring the potential benefits of partnership approaches, we are also being reminded of the importance of well-crafted regulations.

The general case for expecting that an environmental protection regime which includes strong regulations with clear targets can co-exist with (and may help promote) economic efficiency has been made many times, most recently in a paper by Dan Esty and Michael Porter (2001).[2] That paper draws on the findings of the World Economic Forum's Environmental Sustainability Index to argue that those jurisdictions with the most stringent environmental regulations also show the best economic performance. Indeed, Esty and Porter argue that because they enhance efficient use of resources, high levels of environmental stewardship and strict regulations should actually help stimulate a country's competitiveness, economic growth and standard of living.

Experiences with pollution prevention planning and extended producer responsibility provide good illustrations of the important role regulations must continue to play. American states such as New Jersey and Massachusetts took the lead world-wide in mandating pollution prevention planning in the mid 1990s. Most mandatory pollution prevention planning regulatory regimes do not stipulate results: typically, they require designated facilities to prepare a plan and implement whatever pollution prevention measures they identify as appropriate. Recent evaluations of the New Jersey and Massachusetts programmes confirm that mandated pollution prevention planning has resulted in a significant number of companies identifying and implementing cost-effective pollution prevention opportunities. Companies were first forced to identify pollution prevention opportunities and then implemented them because of the cost-savings or short payback period they offered. Without a requirement to do the planning in the first place, however, many of these opportunities might have been overlooked for the foreseeable future.

Canada continues to promote voluntary pollution prevention by implementing similar mandatory pollution prevention planning programmes. The Canadian Environmental Protection Act 1999 contains provisions modelled on state pollution prevention planning programmes in the US. The law authorizes the Federal Minister of Environment to require pollution prevention planning with respect to various substances designated as "toxic". A sewer use by-law recently implemented in Toronto requires all facilities discharging certain pollutants to prepare and implement pollution prevention plans.

Extended producer responsibility (EPR) initiatives are increasingly common – another excellent illustration of the important role well-crafted regulations can play. At least 30 countries have EPR laws for packaging; about 15 have laws concerning battery take-back programmes; and nine now require recycling of electronics components (an identified area of growth for EPR). In Canada alone there are at least 36 federal and provincial producer stewardship programmes for such items as beverage containers, tyres, used oil, packaging, batteries, paint, refrigerants, pesticide containers and other hazardous materials. As a result of increased use of this approach, a shift has occurred over the past few years from asking what EPR is, and whether or not to implement it, to issues of implementation.

The OECD has invested considerable effort in helping to promote EPR and improve our understanding of how to utilize it most effectively. Within the past year both the OECD and Canada sponsored workshops to share experiences and identify lessons learned. One of the key points emphasized at both workshops was that "voluntary" EPR would work under very few circumstances. Unless there are strong pre-existing market drivers, some form of government intervention is required.

A recent review conducted for the OECD identifies "a definite shift from voluntary initiatives of producers to the introduction of mandatory programmes by governments, or a combination of both" (Tojo et al., 2001).

In some cases, negotiated agreements can provide an effective intermediate approach to introducing EPR and similar cleaner production initiatives, where roles and responsibilities can be delineated clearly without the transaction costs associated with a regulation.

Canada recently followed Australia's lead in negotiating with industry a programme to phase out, take back and destroy remaining stocks of CFCs being used as refrigerants. This experience again emphasizes the importance of retaining a credible regulatory regime. Following some years of discussions on this issue, an industry consortium developed an effective scheme very quickly once the federal and provincial governments jointly sponsored development of a model regulation that would have required industry take-back.

We are also learning how to "regulate smarter" by focusing environmental regulations more on products rather than on processes. As Brady and Fava (1999) emphasize, product-focused policies are effective because products are the focal point of many businesses. Addressing products therefore requires a systems perspective that ties environmental issues directly into a company's core business activities. The emphasis on products should also be accompanied by a perspective that accounts for environmental impacts throughout the product's life cycle. A life-cycle perspective can help identify the points of most effective leverage.

Mainstreaming cleaner production through improved industrial and fiscal policies

Despite our collective success in significantly enhancing awareness over the past decade, it must be acknowledged that cleaner production is not on the immediate agenda of every CEO or senior government official.

To achieve this goal, we will need closer integration and alignment of industrial, fiscal and environmental policies. Although some European countries have succeeded in linking environmental and industrial policies, Canada and many others have had only limited success in using pollution prevention and cleaner production concepts and objectives as the basis for reorienting governments' industrial policies.

The key to fostering this linkage lies in recognizing the important focus on innovation underlying all effective environmental policies. It can be argued, for example, that at the heart of pollution prevention is a combination of: i) stimulating the innovation and dissemination of new technologies and processes that add value while dramatically reducing environmental impacts throughout the product life-cycle; and ii) finding new ways to provide services related to delivering the desired function – as opposed to a specific form – required by consumers.[3]

Thus an important objective for many environmental agencies should be to help our counterpart industrial policy agencies understand the potential synergies among environmental and economic objectives that can result from this innovation-based agenda. As full partners in such an agenda, industry departments would be well-placed to develop and deploy levers to promote innovation based, beyond "business as usual" environmental performance.

Such levers could include support for the development, improvement and dissemination of:

- technologies that are consistent with a vision of "eco-effectiveness" or "natural capitalism";
- best management practices (such as environmental management systems, supply chain management, pollution prevention planning and product stewardship);
- standardized analytical tools (such as life-cycle analysis);
- standardized analytical measures (such as life cycle based eco-efficiency indicators that combine measures of environmental and economic performance);
- accurate consumer information (such as product standards, product labels and standardized and meaningful corporate environmental and social responsibility reports).

In many cases industry agencies may be better placed to promote these types of policy measures than are environmental agencies.

Analytical tools, measures and public information form a particularly important package. Together these types of approaches are the key to creating the sort of competitive dynamic within our marketplace that will be required to move us beyond where even the "smartest" environmental regulations will take us.

In this regard, I think governments have an important role to play in encouraging investment markets to account directly for environmental performance. The growth in demand for socially responsible and "green" investment opportunities has been impressive over the last few years. Investment in these areas in Canada is growing at 40% per year and now includes $50 billion or 4% of total assets. In the United States the numbers are higher: $2.2 trillion, equalling 13% of total assets under management.

Notwithstanding this growth, recent work by the World Resources Institute indicates that mainstream investment markets are unlikely to routinely account for the full dimensions of environmental performance until investment analysts are able to understand and measure more easily the links between environmental and financial performance. Recent initiatives in some of the Scandinavian countries and the UK illustrate that governments – and industry and finance departments in particular – can play a very important role in supporting this transition. For example, governments could require more complete corporate disclosure and could also play active roles in helping the investment community develop and learn how to use new analytical techniques that would make these considerations part of routine financial analysis.

While both environmental and industrial policy agencies can encourage and help companies to identify possible "win-win" opportunities resulting from improved environmental performance, the permissible scope of non-financial issues that managers and boards of directors of publicly traded companies are legally allowed to address is typically well outside the domain of environmental agencies. Although polls indicate that most Canadians want companies to address a wide range of social and environmental issues, the country's current corporate governance laws are unclear about the degree to which this would be permitted. Most conventional interpretations restrict corporate managers and boards to considering *only* issues with possible direct impacts on the value of the company (this is their "fiduciary" duty). Many commentators, including most recently the well-publicized "Canadian Democracy and Corporate Accountability Commission", have recommended expanding this duty to enable managers and boards to consider non-financial considerations related to the environment and corporate social responsibility.[4] This is an issue that may be more applicable to North American companies than others, but it is certainly gaining prominence in Europe.

Ultimately, to fundamentally reorient consumption and production patterns it will be essential to integrate environmental costs into product prices through the tax system. In its ongoing work on ecological fiscal reform (EFR), the Canadian National Roundtable on Environment and Economy has identified four key elements of EFR:

- removal of all existing fiscal disincentives to environmentally sound practices;
- use of eco-taxes to help internalize the true costs of production and consumption;
- selective use of incentives to encourage desired behaviour (e.g. accelerated capital cost allowances for energy and material-efficient technologies, revenue neutral taxes on products and practices with high externalities);
- development and use of new measures of progress that account more fully for environmental impacts than the current system of national accounts.

Environmental justice

Environmental justice, an issue whose dimensions we are only just starting to appreciate, is another area that will require us to expand the scope of many of our current cleaner production related activities. Environmental justice is one of five new projects being addressed by the OECD Working Party on National Environmental Policies (WPNEP). The United States is ahead of most countries in institutionalizing environmental justice concepts in its public policies. Following Love Canal and other well-publicized incidents, the US Environmental Protection Agency (US EPA) established environmental justice as one of seven guiding principles in its 1993 strategic plan. In 1994 President Clinton issued Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations". The US EPA now has an Office of Environmental Justice, and many states' environment departments have environmental justice offices or programmes.

The US EPA defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, colour, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socio-economic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programmes and policies." The US EPA classifies an "environmental justice community" as one in which residents are "a minority and/or low income group; excluded from the environmental policy setting and/or decision-making process; subject to a disproportionate impact from one or more environmental hazards; and experience a disparate implementation of environmental regulations, requirements, practices and activities in their communities".[5]

Environmental justice is an important challenge for governments. Like various other aspects of the sustainable production and consumption agenda, it is one where we can start to make a difference simply by acknowledging that the issue exists and then working collectively and in partnership with civil society to start to address it.

Notes

1. In this article, the terms *cleaner production* and *pollution prevention* are sometimes used interchangeably. The opinions presented are those of the author.

2. A recent survey of the literature, sponsored by Environment Canada, found these conclusions consistent with the bulk of the academic research in this area. For example, it was found that: i) while some environmental regulations can lead to layoffs in some firms, the overall impact of environmental policies in the United States has been a gain in employment; ii) stricter environmental regulations do not affect exports or trade patterns in the United States or other industrial countries; iii) environmental protection expenditures have a negligible or positive effect on economic performance and industrial productivity; and iv) plants with poor environmental records are not more profitable than cleaner ones in the same industry, even when comparing for age, size and technology.

3. See, for example, Moffet et al., forthcoming.

4. Canadian Democracy and Corporate Accountability Commission (2002) *The New Balance Sheet: Corporate Profits and Responsibility in the 21st Century*. Toronto.

5. See *http://es.epa.gov/oeca/main/ej*.

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Stakeholder perspectives: facilitating organizations

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Summary

Effective dissemination of cleaner production principles depends on the promotion and development of effective partnerships among governments, industries and "facilitating organizations" (e.g. financial and educational institutions, NGOs, technical advisors, consultants and industry associations). Several successful initiatives that involve facilitating organizations are cited. It is urgent for diverse stakeholders to play more active roles in helping society make the transition to sustainable development.

Résumé

La diffusion effective des principes de production plus propre dépend des efforts faits pour promouvoir et développer des partenariats efficaces entre gouvernements, industries et " organisations servant d'auxiliaires " (institutions financières, établissements d'enseignement, ONG, conseillers techniques, consultants et organisations professionnelles, par exemple). Plusieurs initiatives mises en place avec la participation de ces organisations et couronnées de succès sont citées. Il est urgent que diverses parties prenantes jouent un rôle plus actif pour aider la société à évoluer vers le développement durable.

Resumen

Para promover la difusión de principios de producción más limpia es necesario alentar alianzas y asociaciones entre gobiernos, industria y "entidades facilitadoras" (por ejemplo: instituciones financieras y educativas, ONGs, organismos de asesoramiento técnico, empresas consultoras y asociaciones industriales). Se citan diversas iniciativas exitosas con entidades de este tipo. Es imperioso que todos los involucrados desempeñen roles más activos en la transición de la sociedad hacia el desarrollo sustentable.

The promotion and development of more effective partnerships involving governments, industries and other stakeholders is crucial in facilitating accelerated implementation of the changes essential for truly sustainable societies. For effective cleaner production, promotion and implementation of "other stakeholders" means a wide range of facilitating organizations. This article discusses some of the most important types of facilitating organizations and related key issues.

Financial institutions

While maintaining their health and profitability, financial institutions, bankers and investors can make a valuable contribution to more sustainable patterns of production and consumption through their influence at critical decision-making points in many commercial activities. In addition, financial institutions as a sector can benefit from preventive approaches applied to their own operations.

Financial institutions world-wide have started showing interest in cleaner production, as illustrated *in The Pollution Abatement Handbook* produced by World Bank and *The Cleaner Production Policy Guidelines* prepared by Asian Development Bank. However, most current efforts seem to emphasize the management of grant funds and concessional lines of credit, rather than building a capital market and using revolving funds for cleaner production promotion and implementation. In retrospective financing or operation of cluster loans, use of cleaner production concepts and related preventive approaches is still not common in the standard project appraisal process or in the process guidance framework.

Many financing activities have not yet widened their outreach to small enterprises, services and local utilities, perhaps due to credit risks. Private sector participation in cleaner production financing is still rather low, and most of the fund streams are donor driven. Cleaner production financing is used mainly to hasten the decision-making process though it does, in some cases, function to create market pull.

Cleaner production investments are intrinsically attractive to a financial institution, as they have a relatively short payback period due to potential resource and energy conservation, increased productivity and decreased risks. Financial institutions, however, are not usually skilled in identifying or evaluating cleaner production projects themselves. Hence it becomes necessary that they partner with Cleaner Production Centres (CPCs)/National Cleaner Production Centres (NCPCs) or work within a regulatory framework that supports identification, evaluation and implementation of cleaner production projects. During the last decade it has been observed that CPCs/NCPCs are playing increasingly significant roles in the cleaner production project funding process.

Examples of cleaner production investments include installation of new and more efficient heating boilers, new pumps and valves, dust recovery systems, recovery of hydrocarbon vapours, recovery of materials from waste tailings, oil recovery, recirculation and reuse of water and chemicals, installation of new, more resource-efficient equipment, and installation of regulation and monitoring equipment. Experience with cleaner production programmes reveals that a 20% reduction in waste and emissions is achievable with no new investment. A further 10-20% reduction is possible if minor investments are made, with a payback period of less than six months.

The financial sector in the United States is relatively innovative and mature. This, combined with the national pollution prevention (P2) promotion legislation enacted in 1990 and other similar legislation, contributes to the promotion of pollution prevention (cleaner production) investments in many states. Several states have pollution prevention, direct loans for recycling, or revolving loan fund programmes. State loans can enhance the financial capacity of smaller firms, which may not have the resources and collateral to afford commercial financing. Revolving funds also leverage state support by recycling loan monies over a period of years. Examples include the P2 Loan Programme in Ohio, which targets SMEs; the RENEW Loan Programme in Colorado (waste recycling); and the Nebraska Dollar and Energy Saving Loan Programme (small pollution prevention projects).

However, many SMEs fail to qualify for these institutional mechanisms. SMEs are especially critical in developing countries, where they dominate the so-called informal sector. Because of their combined human health and global environmental impacts, they are urgently in need of the foregoing types of assistance to enable them to implement cost and environmentally efficient cleaner production measures.

In the last decade, development-financing institutions such as the World Bank have established a combination of cleaner production technical assistance and financing programmes. Notable among these are the Industrial Pollution Control and Prevention Project (IPPP) of the World Bank in India, with an aggregate financing of US$200 million, the Industrial Pollution Control Project in Brazil (US$50 million) and the Industrial Pollution Control Project in China (US$100 million). In 1996 the World Bank developed *The Pollution Prevention Abatement Handbook: Towards Cleaner Production.* This handbook is now used by several financing institutions as a guide to mainstream cleaner production. Lessons learned from these large cleaner production financing projects must be widely and efficiently disseminated throughout the financing community world-wide.

The potential for clean technology investments in Latin America is considerable. The lack of financial instruments available for investments has led many companies either to avoid making the investments needed or to secure loans at the high interest rates prevailing in the region.

The Multilateral Investment Fund (MIF) was established in 1993 to encourage the growing role of the private sector in Latin America and the Caribbean. Equipped with funding of $1.3 billion, the MIF's broad and flexible mandate addresses the rapidly changing private sector development needs. A key MIF role is to introduce effective new "cluster-based" approaches to promote private sector development. The MIF has adopted a cluster programme for Achieving Eco-efficiency through Cleaner Production and Environmental Management. Encouraging results are being documented and should provide the basis for expansion of these approaches in other regions of the world.

NEFCO's revolving fund system

In 1997 NEFCO (the Nordic Environmental Finance Corporation) established a cleaner production revolving fund system for the Baltic countries (Estonia, Latvia and Lithuania) and north-west Russia, currently amounting to EUR 6.7 million. The objective of the Revolving Fund system is to finance implementation of high-priority cleaner production investments with rapid payback (not more than three years) that yield environmental and economic benefits. Such investments should provide enterprises with encouraging model projects to upgrade business and environmental performance through low-cost measures.

Cleaner Production Centres play a central role by acting as intermediaries between NEFCO and enterprises applying for loans, as well as by identifying and screening projects. Grant-funded seminars and workshops for industrial enterprises have been arranged in cooperation with CPCs in Russia and Lithuania.

The CPCs are also project monitors, providing NEFCO with follow-up reports on each disbursement and a completion report at the end of project implementation.

So far NEFCO has approved 20 loans to Lithuanian enterprises, of which two have been fully repaid and 14 are completed (the companies are repaying the loans according to schedule). Estonia and Latvia have just started activities: two projects have been approved and one is under consideration. In Russia one project is completed and the company is now repaying; six more projects have been approved, but loan agreements have not yet been signed.

Increasing cleaner production investments in developing countries' SMEs

In 1999 UNEP started a four-year project designed to increase cleaner production investments in SMEs in developing countries. The project, which focuses on five demonstration countries (Guatemala, Nicaragua, Tanzania, Viet Nam and Zimbabwe), is being conducted under a trust fund created by the Norwegian government. The demonstration countries represent a wide span of socio-economic conditions, industrial interests and stages of industrialization. Outcomes and experiences in the demonstration countries will be used at the global level to motivate key decision-makers in the financial sector to pursue cleaner production investments in developing countries.

The project is designed to show leaders of financial institutions and industrial authorities how to assess the merits of cleaner production investment proposals; to persuade leaders of financial institutions to introduce credit schemes customized to cleaner production investments; to stimulate the development of new initiatives such as credit lines, trust funds, policy changes and training; to teach cleaner production assessors how to make credit-worthy loan applications; and to improve the general environment for investment in cleaner production in developing countries. Early results have been encouraging.

Educational institutions

Increasing the pace of the implementation of new strategies requires correspondingly new attitudes, values, knowledge and skills for professionals.

To build environmental awareness and capacity for integrated cleaner production promotion, as essentially linked with sustainable development of communities, regions, nations and society, educational "capacity building" is urgently needed at all levels of education and in training activities of all sectors of society.

The "educate-the-educator" approach can be central to capacity building because of its potential to rapidly build national capacity, and for developing pools of expertise that can help internalize the concept and disseminate knowledge more effectively. While many programmes are now in action within universities, colleges and society, the groundbreaking Norwegian programme warrants special attention. The genesis of the "educate-the-educator" approach in cleaner production promotion may be traced to the Norwegian Cleaner Production Capacity Building Programme initiated in Poland and in the Czech Republic. This programme was initially conducted entirely by Norwegian expertise, but was progressively shouldered by local professionals who had received training in earlier sessions. In turn, the Association of Managers for Cleaner Production (AMCP) was created – a core group of active experts on cleaner production in the Czech Republic, established in 1993 by the graduates of the first long-term training programme under the Czech-Norwegian Cleaner Production Project. This continues to be the one of the outstanding, large-scale models of capacity building for promotion of cleaner production implementation.

Cleaner production is a concept that requires a "big picture" examination of the interaction among elements such as product design, production, consumption, societal values, economics and the environment. This may result in a perception that it cannot easily be incorporated into any course structure other than a "cleaner production" course.

However, the interdisciplinary nature of cleaner production is advantageous in training, as it is relevant to nearly all areas of society. For example, in some universities cleaner production course units have been designed for integration into larger courses in engineering, product design, architecture, business administration, political sciences, law, economics, ecology, ethics and religion.

Some educational institutions have set up cleaner production programmes at the graduate level and, in many cases, have initiated cleaner production related electives to complement science, technology and business related education programmes.

Non-governmental organizations

While NGOs vary from industry associations to issue-specific environmental groups, their role is evolving from that of an environmental "watchdog" to one of a partner in problem-solving. Their role in catalyzing and educating the public is central to promoting changes in corporate, governmental and academic procedures. During the last decade, NGOs played a significant role in facilitating the wider dissemination of the core message of cleaner production/sustainable development in multiple forms suited to local languages, interests, situations, values and priorities.

Some NGOs have started brokering innovative partnerships among stakeholders, acting as facilitators in providing a forum for discussion, information exchange and issue resolution. NGOs have also started forming networks to involve diverse stakeholders. And there is a progression in the use of networking methodologies. The experience of cleaner production/sustainable development networking world-wide has induced several agencies and programmes to set up their own networks, based on a common vision with cleaner production/sustainable development. Examples include the Greening of Industry Network (GIN), the International Green Productivity Association (IGPA) and the World Cleaner Production Society (WCPS).

As networks have been formed and operated in partnerships, supply and demand related to cleaner production/sustainable development information and knowledge have increased. This has led to the need for (and establishment of) several information clearinghouses available through the web, hard copy, and face-to-face via training courses and seminars. However, most of the information networks have been supply-driven and little work has been done to actually assess various stakeholders' information needs and demands. Updating of information within database has been and continues to be a major weakness. Future cleaner production information networks may need to move from information to knowledge, and to support field-based counselling centres where advice is also provided.

Technical advisors and consultants

Consultants are experienced in helping organizations implement cleaner production and sustainable production and consumption strategies. In some instances, where environmentally related work is contracted out, highly skilled consultants may be the best source of assistance available.

Technical advisors play an important role by providing information, transferring experience, and guiding their clients in making well-informed decisions. However, to date most of the advice, products and services offered by consultants in the field of environment is end-of-pipe oriented, although the area of expertise in preventive approaches is growing.

Consultants can play a wide array of roles in promoting implementation of cleaner production/sustainable development. For example, they can offer support to the diffusion of cleaner management approaches, better policies, and cleaner products and technologies, which includes devoting attention to the development of the corporate or governmental capacity essential to implement these sustainable development oriented approaches. Hence the development of awareness and skills at all levels on new policies, management approaches, products, processes and technologies is essential. For example, the human capacity element is critical for a technology to evolve from an innovation in the research laboratory to its large-scale diffusion in the field.

Another area of influence for technical advisors is guiding their clients on upcoming and future changes in the economic and social environment and advising them on how to respond to those changes. Instead of providing short-term responses, consultants could develop a long-term strategy to enable them to face the challenge of such changes on a continual basis. Examples of such a long-term strategy would be the use of preventive environmental strategies, or the development of tools to teach their clients how to continue to develop, implement and monitor the results of their preventive strategies.

Czech-Norwegian cleaner production project to train the trainers

Through the Norwegian Society of Chartered Engineers, the Norwegian government finances the transfer of know-how programmes on cleaner production strategies and assessment to several CEEC/NIS. These programmes are designed to facilitate implementation of economically profitable and environmentally beneficial restructuring of industrial processes. Cleaner production assessments have been carried out in 100-500 production companies (demonstration companies) in each country involved over a period of one to six years. In addition, 200 to 800 qualified "cleaner production" advisors have been trained in each country.

Specific educational goals are to educate a minimum of 35-60 authorized local instructors in the first one to two programme cycles, and to educate 200-750 authorized advisors during the following two to five years (to be conducted by authorized local advisors).

The programmes combine classroom studies, group work, in-company project work and in-company advice. Programmes have been established in the Czech Republic, Poland, Slovakia, Lithuania and the Russian Federation.

In Poland the programme is currently maintained by the Polish Cleaner Production Centre (NIF-NOT), which coordinates the work of Polish engineering societies in promoting cleaner production training.

College and university approaches

Colleges and universities are demonstrating many innovative approaches in response to societal capacity building needs related to cleaner production/sustainable development and, more broadly, "ecological literacy" throughout society.

One such programme, at Monash University in Australia, developed accounting practices that include cleaner production principles. The University has formed an association with accounting bodies to disseminate cleaner production, as well as developing specific environmental accounting course modules.

For more information, see www.monash.edu.au.

The International Institute of Industrial Environmental Economics (IIIEE) at Lund University in Sweden has an intensive 14-month interdisciplinary Master's Programme on Environmental Management, Cleaner Production and Sustainable Development.

The IIIEE programme, now in its seventh year, involves several hundred graduates working in multidisciplinary teams in governments, industries, consultancies, financial institutions and NGOs. Participants are working towards capacity building, which is crucial to accelerating the transition to sustainable societies.

For more information, contact IIIEE (www. iiiee.lu.se).

Another programme designed to facilitate capacity building at the Ph.D. level is the International Off-Campus Ph.D. Programme in Cleaner Production, Cleaner Products, Industrial Ecology and Sustainability begun eight years ago at Erasmus University in Rotterdam, the Netherlands. This programme is designed for professionals already working full-time in government, industry, academia or NGOs to further develop their capacity by concurrently carrying out their Ph.D. research and thesis development. The approximately 25 candidates are similarly active within these sectors.

For more information, contact Dr. Leo Baas (baas@fsw.eur.nl).

A new, rapidly evolving programme launched at Monterrey Tec in Monterrey, Mexico, is designed to educate the 9000 educators belonging to its 32-campus network throughout Latin America in the concepts, approaches and tools of cleaner production/sustainable development. This programme includes an annual symposium series with lectures by world-famous academic, governmental, industry and NGO leaders. Such key events are broadcast via Tec's Virtual University network.

For more information, contact Dr. Francisco J. Lozano (fjlozano@campus.mty.itesm.m).

These examples of cleaner production/sustainable development educational and research activities in higher education are a small part of a slowly growing number of programmes. Unlike demonstration projects and industry based awareness programmes, cleaner production education and research at colleges and universities have traditionally received little investment from multilateral/international aid agencies. Cleaner production classes and courses at universities seem to have been developed and delivered largely by cleaner production/sustainable development enthusiasts, without any financial or adequate informational or educational resources.

The Greening of Industry Network (GIN)

The Greening of Industry Network stimulates, coordinates and promotes research of high quality, relevance and usefulness aimed at ensuring that the activities of industry (including business, labour, consumers and government) are consistent with building a sustainable future. Research is often the cognitive and instrumental basis for policy-making, legislation and industrial strategies. An international, interdisciplinary network of researchers linked with these stakeholders is working to identify and stimulate needed research, and to engage in dialogue to create sustainable policies, strategies and actions. Through an agenda of linked conferences, publications and communications begun in 1991, GIN seeks to create new relationships, visions and practices for sustainability.

The Greening of Industry Network comprises over 1500 individuals representing academia, business, public interest groups, labour and government in 50 countries. Network participation is open to all.

For more information, contact GIN (*www.greeningofindustry.org*).

Industry associations

Industry associations are another group of facilitating organizations that have a substantial impact on corporate activities and decisions, as part of their mission is to inform the leaders of member corporations about relevant issues pertaining to their operations. Such associations provide an important platform for discussions on the future of their sector or on industry as a whole. Governments are increasingly involving industry associations in the process of policy formulation and implementation. Industry associations are also considered by their members to be a source of reliable advice and expertise.

In some countries the trade associations of different industry sectors have begun to develop a policy concerning the environmental aspects of members' activities. They have also started giving environmental performance commitments on behalf of their members. The signing of the International Declaration on Cleaner Production by a number of national and international industry associations (72 as of December 2002) is testimony to this development. The Responsible Care programme of the Chemical Manufacturers Association is the first globally structured programme developed by industry that focuses on decreasing the environmental impact of members' activities and products. Another example is the Australian Mining Association's Mining Code of Conduct, which addresses activities of affiliated corporations on environmental, ethical and equity issues. ◆

1. This article was writtten in cooperation with Surya Chandak, Coordinator, Cleaner Production, UNEP DTIE, 39-43 quai André-Citroën, 75739 Paris Cedex 15, France (surya.chandak@unep.fr)

International Declaration on Cleaner Production: recent signatories

Following the second plenary session of the Seventh International High-level Seminar on Cleaner Production (CP7), Jacqueline Aloisi de Larderel, UNEP Assistant Executive Director and Director of the Division of Technology, Industry and Economics, presided over the signing of the International Declaration on Cleaner Production by several seminar delegates.

The new signatories were:

- Christoph Beier, Director of Planning and Development, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), a development cooperating consultancy, Germany;
- Gustavo Gonzalez-Quijano, Secretary General of the Confederation of National Associations of Tanners and Dressers of the European Community (COTANCE), Belgium;
- Otakar Kaucky, Managing Director, Kovohutě Příbram, a recycler of lead and other metals, Czech Republic;
- Miroslav Krějcí, Vice President, Eastman Sokolov (formerly Chemicke zavody Sokolov), Czech Republic;
- Vit Vaněk, Chairman, Stavíme ekologickypri, Svazu podnikatelů ve stavebnictví (Association of Construction Entrepreneurs), Czech Republic;
- Odeh S. Al Zaghmouri, General Manager, Palestinian Federation of Industries.

Odeh S. Al Zaghmouri, General Manager of the Palestinian Federation of Industries, signing the International Declaration on Cleaner Production

The Declaration was launched in 1998, with 67 signatories, at the Fifth International High-level Seminar on Cleaner Production in Seoul, Korea. It is a voluntary public statement of commitment to the strategy and practice of cleaner production.

As of October 2002, six signing ceremonies had been held since CP7, adding another 24 signatories. These include the governments of Latvia, and of Italy's Basilicata region, as well as signatories from Ethiopia, Poland, Brazil, China and Latvia. Over 350 organizations are now listed on UNEP's register of high-level signatories.

The text of the Declaration (in several languages) as well as information about the signatories can be found at *www.uneptie.org/pc/cp/declaration/home.htm.*

Cleaner production in Sri Lanka

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Summary

Several Sri Lankan organizations and projects concerned with cleaner production are described in this article. One of these organizations, Small and Medium Enterprise Developers (SMED), was created in 1989 to develop management and technical capacity in industry and the service sectors. Since 1997 it has conducted seminars and workshops promoting cleaner production and related concepts throughout Sri Lanka. It has also carried out other projects relating to cleaner production. SMED was chosen as the most suitable organization to host Sri Lanka's National Cleaner Production Centre, which became operational in 2002. The Ministry of Enterprise Development, Industrial Policy and Investment Promotion is the SMED's government counterpart.

Résumé

L'article décrit plusieurs organisations et projets sri-lankais qui s'intéressent à la production plus propre. L'une de ces organisations, Small and Medium Entreprise Developers (SMED), a été créée en 1989 pour développer les capacités techniques et administratives des entreprises industrielles et des prestataires de services. Depuis 1997, SMED anime divers séminaires et ateliers à travers le Sri Lanka pour promouvoir la production plus propre et les concepts connexes. SMED a également mis en œuvre des projets axés sur la production plus propre. Cette organisation a été considérée comme la mieux placée pour héberger le Centre national de production plus propre du Sri Lanka qui a commencé ses activités en 2002 et dont l'homologue au sein du gouvernement sri-lankais est la Direction de la politique industrielle et de la promotion des investissements, au ministère du Développement des entreprises.

Resumen

El artículo menciona diversos proyectos y entidades de Sri Lanka vinculados a la producción más limpia. La organización Desarrollo de la Pequeña y Mediana Empresa (Small and Medium Size Enterprise Developers – SMED) fue creada en 1989 para desarrollar capacidades técnicas y de gestión en sectores industriales y de servicios. A partir de 1997 fue responsable de la organización de seminarios y reuniones de trabajo para la difusión de temas de producción más limpia en Sri Lanka, además de promover otros proyectos relacionados con producción más limpia. SMED fue elegida como sede del Centro Nacional de Producción más Limpia de Sri Lanka, que comenzó a operar en 2002. El Ministerio de Desarrollo Empresarial, Política Industrial y Promoción de Inversiones es su contraparte en el gobierno.

Sri Lanka is an island republic with a total area of 65,610 sq. km. (including inland waters). Its population is around 19 million; the literacy rate is approximately 92%. GNP per capita is some US$ 841.

Since Sri Lanka gained independence in 1948, average annual growth in GDP has been around 4-5%. In 2000 GDP increased by 6%, reflecting the global economic situation. Sri Lanka experienced a contracting economy for the first time in 2001.

The government has undertaken major policy reforms, establishing a target of 10% GDP growth within the next five years. This level of growth will be necessary to achieve substantial reduction of poverty, as well as to reconstruct and rehabilitate the Northern and Eastern Provinces with the advent of the peace process. There has been considerable progress in reducing poverty since independence, as shown by Sri Lanka's human development indicators.

The sectoral composition of GDP in 2000 was 20% agriculture, 17% manufacturing, 54% services, 1.7% mining and 7% construction. Almost 40% of Sri Lanka's population depends for its livelihood on activities centred around land. Compared with 1999, the share of manufacturing in GDP has increased while the agriculture's share has fallen.

The economy of Sri Lanka will continue to depend heavily on natural resources. The main energy sources are biomass (59%), hydropower (14%) and petroleum (27%). Hydropower is used for approximately 45% of electricity generation.

Apart from increased industrial activity, population growth exerts pressure on natural resources. It has contributed to a rapid decline in the land-per-person ratio (forcing people to encroach on state land), natural soil erosion in hilly areas, erosion in coastal areas, and excessive sand mining.

With economic development it is expected that there will be accelerated growth in construction. Consumption of sand in 2002 is estimated at 7 million m^3, increasing to 12 million m^3 in 2006.

Water

Only 14% of the rural population has access to piped water, compared with 75% of the urban population. The National Water Supply and Drainage Board (NWSDB) estimates that 40% of water provided by the piped water system is non-revenue producing. This is mainly due to welfare measures, poor maintenance and leakages.

The most significant reasons for water body pollution are demand for water by the expanding industrial sector (thus increasing effluent load), together with urbanization and the consequent generation of waste, especially sewage. There is increasing consumption of water and agro-chemicals used in agriculture. Surface and groundwater quality is affected by fertilizers, herbicides and pesticides.

Oil pollution occurs in most urban, suburban and coastal areas. For example, garages and service stations dispose of waste oil to surface drainage systems.

Salinity in irrigated paddy fields, while not yet extensive, appears to be increasing.

Air

The National Building Research Organization (NBRO) and the Central Environmental Authority (CEA) monitor air pollution using two fixed and one mobile air quality monitoring laboratory units. Sulphur dioxide (SO_2) and ozone levels in 1996 exceeded ambient standards set by the CEA at certain times of the year. The main pressures on the atmosphere are due to fossil fuel consumers and the transport, industry and power generation sectors.

Forest

Forest cover, occupying both wet and dry zones, has steadily decreased over the years (80% of land area in 1881, for exapmle, compared with 22% in 1992). Average annual deforestation between 1956 and 1992 was over 36,000 ha.

Coastal resources

Sri Lanka has 1585 km. of coastline. The coastal zone represents 24% of total land area and 65% of the total urban area; 30% of the population lives in the coastal zone. Environmental problems result from coral mining, large-scale clearance of coastal vegetation for aquaculture and other uses, exploitation of mangroves (which cover about 16,000 ha.) to obtain fuel wood, sand mining in coastal areas, unplanned construction, and dumping of waste.

The national pollution control structure

The Central Environmental Authority (CEA) was established in 1981 with the enactment of the 1980 National Environmental Act (NEA). Two important legal instruments were created under the NEA: environmental impact assessment (EIA) and the environmental protection licence (EPL).

While all development activities classified as "prescribed projects" are required to obtain EIA clearance from the appropriate authority, there has been reluctance to do so. The EPL process for industrial units has been decentralized, and local authorities are empowered to issue licences to specific industries. Both these processes have been simplified to enable entrepreneurs to invest in and continue their ventures without administrative impediments.

In 1990 a separate ministry was created to formulate policies, and to address and coordinate all matters relating to environmental management. The National Environment Action Plan (NEAP) is the basic environmental management document. The current NEAP (1998-2001) is under revision.[1]

The Committee for Integration of Environment and Development Policy (CIEDP), a coordinating mechanism co-chaired by the Secretaries of the Ministries of Finance and Planning and Forestry and Environment, was established in 1996. It is supported by sectoral Committees on Environment and Policy Management (CEPOMs) in the following areas: biodiversity, land, water, energy and climate change, industry, coastal and marine areas, urban and built environments, and environmental health.

Cleaner production

After the framework for pollution control was well-established (with varying mechanisms) pollution control measures were not generally adopted by industry, mainly due to the high cost of end-of-pipe control methods and equipment. Companies trying to survive in the market were not eager to add the further costs of treating pollutants. However, cleaner production is a sustainable way to mitigate pollution and remain competitive at the same time.

One CP initiative was the Industrial Pollution Reduction Programme (IPRP), a UNDP funded, Central Environmental Authority (CEA)/ UNIDO managed project based at the CEA that covered several aspects of industrial pollution abatement. The most significant and result-oriented aspect concerned cleaner production. Under this programme, begun in 1993, two batches of technical personnel (15 each) were trained in cleaner production assessment. The professionals trained were chosen from a wide spectre, representing industry, academic institutions, development banks, private consultants, research institutions, etc.

The two groups of personnel together carried out CP demonstration exercises in the following industry sub-sectors:

- coconut;
- leather tannery;
- rubber (latex processing) (2);
- meat and chicken processing (2);
- paint manufacturing;
- hotel;
- glass;
- rubber product manufacturing.

CP demonstrations in the electroplating, textiles and tannery industries were conducted by local institutions under the guidance of international experts. Financial assistance, available under a revolving fund, was provided for the glass, sugar, distillery, metal finishing, textiles and tannery industries, among others.

Organizations working in the cleaner production field

Small and Medium Enterprise Developers (SMED)

Small and Medium Enterprise Developers (SMED) is a project of the Federation of Chambers of Commerce and Industry of Sri Lanka (FCCISL) and Sri Lanka's Friedrich Naumann Stiftung (FNSt). SMED was created in 1989 to develop management and technical capacity in industry and the service sectors.

During the IPRP project, a SMED consultant was trained in CP. This initiated a number of CP promotional seminars and workshops, especially with the private sector. Gradually the SMED cleaner production department was established and staff strength was increased. It is now well-equipped with in-house and external expertise in CP, ISO 9000, ISO 14000, productivity and EIA.

Staff have been trained locally and abroad, including in Japan, Germany, Taiwan, India and the United States. SMED currently has five trained officers in-house and an external resource base of CP consultants who are utilized depending on the work in hand.

During the last five years SMED has carried out several workshops and implementation programmes, in association with FCCISL and other provincial chambers and industry associations. SMED is also engaged in promotional campaigns with other organizations that play a supporting role vis-à-vis the business sector. These organizations range from government ministries to provincial councils to local authorities.

SMED has been associated with the Asian Development Bank, UNEP, UNIDO, UNDP, USAID and other donors in carrying out cleaner production programmes in Sri Lanka

Since 1997 SMED has conducted seminars and workshops that promote cleaner production and related concepts in every part of Sri Lanka, including awareness programmes targeted to the media carried out with the assistance of the Ministry of Transport and Environment. As a result, media publicity and coverage (both electronic and print) concerning CP are increasing.

The Ministry of Environment has entrusted SMED with conducting one-day walk-through CP audits of 50 industrial establishments in the Kelani Valley Basin. The first publication on cleaner production in Sinhala, Sri Lanka's official and national language, has been launched.

Industrial Services Bureau

The Industrial Services Bureau (ISB) of North Western Province has participated very actively in energy and environmental management activities since it was created in 1990. As a natural extension of well-established energy and environmental management activities, ISB is engaged in introducing cleaner production to Sri Lankan industries, particularly those operating in the North Western Province.

ISB has carried out three cleaner production awareness programmes. One programme was for representatives of the desiccated coconut, fruit processing, rubber, hotel and other sectors. The purpose of the other two programmes was to create awareness of cleaner production in the desiccated coconut and coconut charcoal manufacturing sectors. ISB has initiated a programme for conducting a cleaner production demonstration project in the desiccated coconut sector, in association with the National Cleaner Production Centre.

National Engineering Research and Development Centre

The following CP related activities were carried out by the Energy and Environmental Management Centre of the National Engineering Research and Development (NERD) Centre between 1997 and 2002:

- two cleaner production audits and 25 energy audits since 1999;
- design and implementation of a waste heat recovery system for a ceramics factory;
- seven training programmes in cleaner production and energy related areas since 1998.

The other organizations involved in CP awareness creation are the Ceylon Chamber of Commerce and the Industrial Technology Institute.

Related projects

The UNIDO "triple bottom line" demonstration project

The concept of the triple bottom line (TBL), a term coined by author and management consultant John Elkington in 1997, is a new way for business people to incorporate sustainability into their day-to-day activities to achieve better productivity while satisfying buyers. TBL refers to the three prongs of social, environmental and financial accountability, which are directly associated with the concept and goals of sustainable development. It examines business ethics, corporate social responsibility and human rights, all of which are essential to sustainable development. TBL, when properly implemented, will provide information that can be used by buyers to assess how sustainable an organization is. To be sustainable, the organization must be financially secure, minimize or eliminate negative impacts on the environment, and act in conformity with the justifiable demands of the employees.

The UN Industrial Development Organization (UNIDO), after studying international development and pressure from buyers, has undertaken a project to introduce the TBL concept in South Asian countries. The project's inaugural seminar took place on 24 March 2001. The purpose of the seminar was to train representatives from India, Pakistan and Sri Lanka on implementation of the

TBL demonstration projects in their respective countries.

SMED, which hosted this seminar, was chosen to implement the TBL demonstration project in Sri Lanka. Implementation was carried out in six export-oriented companies in four sectors: rubber, apparel, textiles and confectionery. Each company was requested to appoint a team consisting of representatives from top management, middle management and the shop floor.

Initially, SMED consultants trained the teams to handle the TBL project work in their respective organizations. The existing situation with respect to the financial and social bottom lines (including health and safety) was assessed using a set of questionnaires. By studying the waste generated by each unit during the production process, the team assessed the environmental bottom line. Finally, through brainstorming sessions, options were generated for improving the existing situation.

A few organizations have implemented these options. By doing so, they have achieved the benefits described below.

The rubber industry

Reduction of latex wastage from 8 to 6% in the first month resulted in a monthly savings of Rs. 175,000. One-third of this amount was distributed to workers. Rs. 10,000 per month was saved by tuning up the boiler burners and stopping steam leakage.

The garment industry

Solid waste (cut pieces, polythene and paper) was collected separately and sold for recycling. The money generated was used to finance welfare measures for workers. The absenteeism that had been a problem in one firm was reduced from 10 to 5% by appointing a counsellor.

Textiles

Solid waste was collected and sold, and the money was used to benefit workers. Chemicals in the supply chain which created a production problem during the dyeing process were changed after consultation with suppliers, resulting in substantial savings.

Confectionery

This industry opted only for one high-cost option: installation of machinery for bulk handling of oil.

Sri Lanka's National Cleaner Production Centre

Establishing a National Cleaner Production Centre (NCPC) in Sri Lanka has been a very important step with respect to CP promotion and capacity building. After the successful Industrial Pollution Reduction Programme (IPRP) ended in 1998, UNIDO provided an international consultant to identify a suitable institution to host Sri Lanka's NCPC. Thus the successful NCPC network established by UNIDO/UNEP could be extended to this country. Following a detailed study, the consultant recommended Small and Medium Enterprise Developers (SMED) as the organization most suitable to host the NCPC. The Ministry of Enterprise Development, Industrial Policy and Investment Promotion was designated as the government counterpart. The Norwegian government provided initial funding with a grant of NOK 13,000,000.

The NCPC began operating in 2002. It will be instrumental in CP promotion and dissemination in Sri Lanka, as well as capacity building for successful application of CP in industry. The NCPC will undertake the following activities:

- in-plant assessment, including integrated CP/EMS assessment;
- awareness raising;
- training;
- dissemination of technical information;
- promotion of CP investments;
- policy advice.

Industry is very rapidly becoming aware of the advantages of cleaner production, which can produce economic benefits while preventing negative environmental impacts. Several sectors (hotel and catering, metal, fibre, food, tea, chemicals, textiles and printing) have already implemented CP solutions and obtained very successful results.

Other supporting programmes in 2001-02

Other supporting programmes being carried out in the period 2001-2002 are:

- UNIDO ISO 14000 training of auditors/consultants and a pilot project on certification of ten companies;
- establishment of a sub-contracting and partnership exchange (SPX) by UNIDO at the Federation of Chambers of Commerce and Industry of Sri Lanka (FCCISL/ SMED), which will extend its services to establish programmes on waste exchange and greening of the supply chain;
- a UNIDO tannery development project, involving use of CP technology for treating tannery wastes along with modernization and relocation of tanneries to the industrial estate being established in Bata-atha in the Southern Province.

SMED is also hosting a UNEP funded demonstration project on reduction of greenhouse gases (GHGs) using CP strategies.

Cleaner production financing

Funding of pollution abatement has been available to Sri Lankan industry for the past eight years. Several industries have used this funding to set up effluent treatment plants, dust extraction systems, and other types of equipment. With the advent of cleaner production, the need to include provisions for funding of CP options has arisen. As a result, the E-FRIENDS concessionary funding scheme was launched by the National Development Bank.

E-FRIENDS is an environmentally friendly solution fund for industries. Funded by the Japan Bank for International Cooperation and administered by the National Development Bank, it provides technical assistance and low-cost loans to firms interested in waste minimization, resource recovery/savings, and pollution control/abatement. The fund has two components: a general loan component at concessionary interest rates, and an interest-free technical assistance loan component. Any financially viable firm already operating or scheduled to begin operations will be considered for this loan scheme.

Government intervention

Within a short time the Sri Lanka government has understood the importance of cleaner production, mainly owing to the effectiveness of private sector CP initiatives and public-private partnerships.

The government has taken a major step by implementing the Clean Industry Development Project (CLIND), a one-year programme sponsored by the Ministry of Enterprise Development, Industrial Policy and Investment Promotion. This programme is funded by the Asian Development Bank (ADP). In collaboration with a wide range of stakeholders, it undertakes to develop the strategy, action plan and policies Sri Lankan industry needs to implement cleaner production, increase production efficiency, improve international competitiveness and work towards sustainable development.

Development of the strategy and action plan is based on extensive research and discussions, especially advice from representatives of many private sector firms and organizations. This combination of understanding, policies, incentives, rewards, pressures and other conditions can make it clear to a business person that taking action for CP is in a firm's best business interests.

Developing a workable strategy and action plan requires collaboration by many sectors of government, business and the community. Representatives of different perspectives and interests need to come together to discover their common interests in achieving cleaner production. The agenda of each stakeholder can contribute to a combined, integrated plan to achieve CP nationally, and to work aimed at integrating CP principles into policy and programmes at all levels and in all economic sectors.

The principle objective of this project is to formulate a strategy for integrating cleaner production into industrial development, which will assist the government of Sri Lanka in reducing industrial pollution.

Outlook

With the rapid development of industries, industrial estates and the SME sector, cleaner production has great potential in Sri Lanka. Sub-sectors such as tourism (which is being given high priority by the government) will further enhance cleaner production's potential, especially in the hotel and catering sector.

Sri Lanka is becoming a more consumer-oriented society. The need to develop the agro-food and health sectors is being felt. Cleaner production will make it possible for industries to comply with food standards such as HACCP.[2] Recent health sector reforms are considering CP approaches in order to minimize vector-borne diseases. CP strategies are also being considered in the search for sustainable solutions to the growing problem of garbage volumes (currently 2484 tonnes per day), the acute water problem, high post-harvest losses (currently almost 50%) and increasing volumes of construction waste.

Notes

1. Other instruments relating to the environment developed over the years include: National Conservation Strategy (1980); clean air (2000); coastal areas (1994-2000); Forestry Sector Master Plan (1995); Forestry Policy (1994); National Industrial Pollution Management Policy: A Framework for Analysis (1998); Refrigerant Management Plan (2000); Initial National Communication under the UN Framework Convention on Climate Change (UNFCCC) (2000); National Action for Protection of the Marine and Coastal Environment from Land Based Activities (1999); Biodiversity Conservation in Sri Lanka: A Framework for Action (1998); National Industrial Pollution Management Policy Statement (1996). Sri Lanka has also ratified over 25 important multilateral environmental agreements (MEAs) during the last 20 years, including the Basel Convention on the Transboundary Movements of Hazardous Wastes and their Disposal (1989), the Montreal Protocol (1987), the Kyoto Protocol (2002), the Convention on Biological Diversity (1992), the Ramsar Convention on Wetlands of International Importance (1971) and the Convention to Combat Desertification (1994).

2. Hazard Analysis and Critical Control Point. For a brief introduction to the HACCP approach to food safety, see (among other sites) *www.fda. gov/opacom/backgrounders/haccp.html* and *www. nal.usda.gov/fnic/goodborne/haccp/index.shtml.*

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Green productivity: an Asian approach to sustainable development

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Summary

The concept of green productivity was introduced by the Asian Productivity Organization (APO). Green productivity is a strategy for improving both productivity and environmental performance. It aims to ensure well-rounded socio-economic development, leading to sustained improvement of the quality of human life. Applying appropriate productivity and environmental management tools, techniques and technologies can reduce the environmental impacts of an organization's activities, products and services while increasing profitability and competitive advantages. Recommendations are made with respect to innovations by stakeholder groups (including governments, industry and academia) intended to bring about greater sustainability.

Résumé

Le concept de productivité verte a été lancé par l'Asian Productivity Organization (APO). La productivité verte est une stratégie pour améliorer à la fois la productivité et les performances en termes d'environnement. Elle vise à assurer un développement socio-économique harmonieux pour une amélioration soutenue de la qualité de la vie. En appliquant des outils, techniques et technologies appropriés de gestion de la productivité et de l'environnement, il est possible de réduire les impacts sur l'environnement des activités, produits et services d'une entreprise, tout en améliorant sa rentabilité et ses avantages concurrentiels. Des recommandations sont faites aux parties prenantes (pouvoirs publics, milieux industriels et universitaires, notamment) à propos des innovations susceptibles de permettre un développement plus durable.

Resumen

La Organización Asiática de Productividad (ASP) introdujo el concepto de producción verde. La producción verde es una estrategia para aumentar la productividad y al mismo tiempo mejorar el comportamiento ambiental. Apunta lograr un tipo de desarrollo económico social que tienda hacia la mejora sostenible de la calidad de vida humana. La aplicación de herramientas, procesos y tecnologías de productividad y gestión ambiental adecuados, permite reducir el impacto ambiental generado por la elaboración de productos y servicios y al mismo tiempo aumentar el rendimiento y las ventajas competitivas de una empresa. Se hacen recomendaciones referentes a las innovaciones de sectores involucrados (incluyendo gobiernos, industria y comunidad académica) cuyo objetivo es generar mayor sustentabilidad.

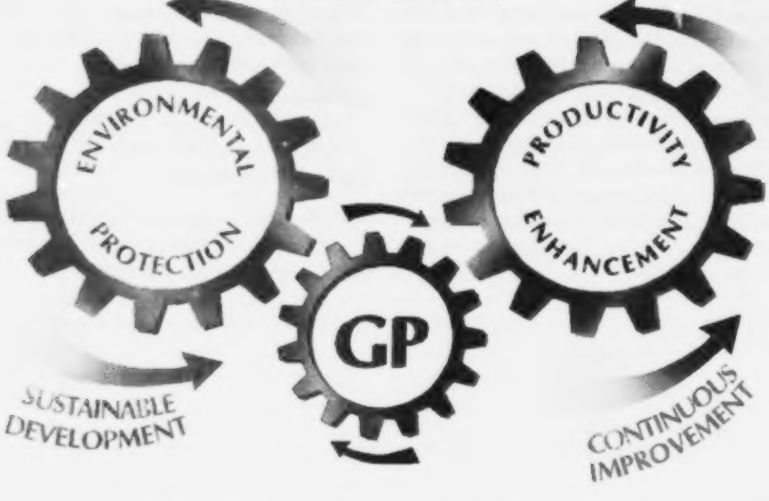
Two such simple words: "sustainable" and "development." Yet, when combined, they represent the single greatest challenge to collective creativity and the intellectual spirit humans have ever faced. In the 30 years since the concept of environmentally sustainable economic development was introduced at the 1972 Stockholm Conference on the Human Environment, environmental issues have evolved from an intellectual pursuit for relatively few people to a core mainstream business concern.

At the 1992 Earth Summit in Rio, governments adopted Agenda 21 and the UN Declaration on Environment and Development. The time had arrived to move from rhetoric to results. Up until the World Summit on Sustainable Development (WSSD) recently concluded in Johannesburg, and despite the challenge and the potential for success, countries have not begun to take part in the marathon towards sustainability in a unified way.

The Asian Productivity Organization (APO) is a regional intergovernmental organization based in Tokyo. At APO we believe we have found a track that moves us from rhetoric to a point at which we have evidence of results. The key is a broad, integrated, productivity-based approach. In this article we present the concept we call "green productivity" and share our efforts to serve as a catalyst for change.

Green productivity is a strategy for simultane-

Figure 1
Green productivity (GP)



ously enhancing productivity and environmental performance (**Figure 1**). Its aim is well-rounded socio-economic development, leading to sustained improvement in the quality of human life. The combined application of appropriate productivity and environmental management tools, techniques and technologies reduces the environmental impacts of an organization's activities, products and services while enhancing profitability and competitive advantage.

In 1994, under a special grant from the Japanese government, the APO launched its Special Programme for Environment to help its member economies integrate environmental concerns into their productivity enhancement activities. There was a special focus on small and medium-sized enterprises (SMEs), in recognition of the important role they play in economic development and environmental degradation, as well as the lack of resources and expertise that generally limits SMEs' involvement.

In 1996 the APO tabled its strategy to meet this challenge head on – through green productivity. At the December 1996 World Conference on Green Productivity in Manila, the APO provided evidence that it had found a way to move sustainable development from the possible to the practical.

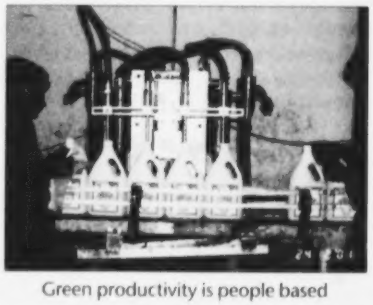
The starting point was productivity considered as a cost reduction strategy. By picking up the baton of quality, productivity has metamorphosed to incorporate environmental protection and community enhancement as the means to increase prosperity. Under the umbrella of green productivity, innovation (one of the main engines of economic growth) becomes part of a holistic strategy for moving towards a sustainable future.

Just as productivity was the essential strategy that enabled Japan to rebuild after the Second World War, with other Asian countries being influenced by its success, the 19 APO member economies have rallied behind green productivity (a more broadly defined concept of productivity) to take part in this marathon for sustainability. Green productivity begins with an intellectual dare: to shift from a monochrome bottom line to a more colourful triple bottom line.

How green productivity helps enterprises

Green productivity focuses on enhancing profitability through combined improvements in productivity and environmental performance. This engenders an important mind shift, from environment as a cost or externality to an asset and an opportunity to increase both efficiency and profitability. The power of this mind shift is not to be underestimated.

When excessive use of resources and materials, or generation of pollution, are seen as manifestations of lower productivity and poor environmental performance, they can be treated as manufacturing defects that need to be consistently corrected. The next level of green productivity offers the logical method drawn from quality management, providing practical tools and techniques. Knowledge and approaches under the umbrella of green productivity can help companies attack their productivity challenges with increased confidence, leading to a better bottom line and competitive advantage.


Green productivity is people based

Green productivity seeks technical and managerial interventions based on the concept of continual improvement. Another important factor, along with this mind shift, is a transition from end-of-pipe thinking to design for environment. Design changes necessitate research and development, which means a company's response will evolve from concentrating on the cost of clean-up to the excitement of innovating new products and services. Making products and services greener as a condition of innovation is significant. It excites business, motivates investors, intrigues employees and attracts consumers. Government has a role to play in fostering this evolution.

Government policy is an important force for removing barriers to innovation and for encouraging sensible thinking about support for new technologies that enhance rather than degrade the environment. Green productivity is being aided by the shift to a demand side market. As consumers have more money, they are asking for products with environmental sensitivity, ranging from shade tree coffee to recycled paper stock to cars with lower emissions to greener energy sources. The lucrative lure of the market is a carrot. As markets demand greener products and services, green productivity helps stimulate the supply side by providing a logical process and the practical tools and techniques with which this transformation can be accomplished.

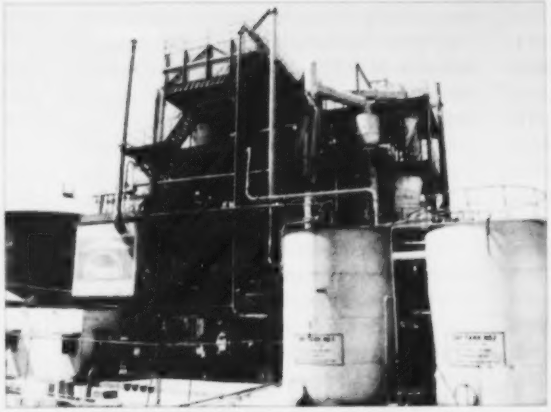
This concept is gaining ground because it is an integrated approach that addresses the concerns of policy-makers and the realities faced by producers. Green productivity is characterized, in particular, by the following four qualities.

◆ It is integrated and people based. One of the strengths of green productivity is its worker involvement and team based approach. This people based approach extends to improved working environment, worker health and safety, non-discrimination, and related social welfare issues. People involvement also ensures transparency and accountability.

◆ It relies on information-driven improvement. Documentation and reporting are strengths of green productivity, drawn from management systems that exist for quality and the environment (QMS and EMS, respectively). The adage "What gets measured gets done" is one of the driving forces of green productivity. An organization's performance once it has established a green productivity programme will be continuously measured and evaluated using a set of defined green productivity performance indicators.

◆ At its heart is environmental protection, which is the purpose of legal instruments. This is one of the greatest challenges facing industry. Green productivity provides tools and techniques for pollution prevention and source reduction. Residues, for example, require management using end-of-pipe treatment. While achieving environmental compliance, it is the unique characteristic of green productivity that productivity will also improve. These practices may lead to a situation beyond compliance, with the ultimate aim of ensuring quality of life. It is paramount that governments support enterprises as they develop innovative new technologies that go beyond compliance, as these technologies will bring greater returns.

◆ It is based on continuous improvement. The other side of the coin is improved productivity, based on the Kaizen approach of continuous improvement. The cyclical quality management approach of Plan-Do-Check-Act (PDCA) is derived from the study of how variation is managed in nature. Green productivity leverages this congruence to obtain profit-oriented results, which need to accompany environmental protection. The concept of continuous improvement, achieved through adopting the tenets of the PDCA cycle, is aimed at ensuring not only productivity improvement but also (unlike in classical productivity improvement) programmes for environmental improvement.



Green productivity: increasing productivity while reducing environmental impact

Green productivity framework

Ecological and productivity principles place responsibility and accountability for environmental protection in the producer's hands, so that the business benefits of profit and competitive advantage reward those who take action.

Green productivity has an open framework for absorbing several of the existing, proven approaches that leverage the benefits of, for example, eco-efficiency, cleaner production and pollution prevention. This framework is based on two key components: a set of tools used to rationalize the input-throughput-output focus, and a set of defined sustainable practices that guide the practitioner in achieving green productivity.

The emphasis of this framework is not, however, on terminology or systems. It is based on the strategy of sustainability in economic development and environmental protection, a logical step-by-step path for change.

The benefits of adopting this framework must be measurable. Progress has to be shown and shared. An organization's performance, based on the impact of green productivity, can be measured using Multifactor Productivity (MFP) and Profitability Analysis. These types of measurements are commonly used in business.

Life cycle assessment (LCA) is used to generate information about a product/service. Using this information, decisions are made on product design, manufacturing practices, purchasing policy, product distribution and management practices.

Product design must follow the principles of eco-design, thereby recognizing the need to develop products with a lower environmental burden. Having incorporated eco-design principles into product design, the first step is to examine the purchasing policy for inputs and, where required, modify it to ensure green purchasing.

Apart from green purchasing, eco-design requires that environmental objectives be incorporated into the manufacturing operation (with no or minimum loss of product performance, useful life or functionality) while reducing waste generation, reducing the product's toxics content, and reducing the product's energy requirements and/or extending its useful service life. This will also help ensure health and safety in the workplace, as well as that of consumers using the products. In using eco-design as a basis, product stewardship must be adopted in the distribution, use, and disposal of the outputs (products).

Green productivity advocates the need to generate profits, whether through savings on raw materials resulting from resource efficiency, improved productivity, quality, sales, or other factors. Green productivity recognizes that profitability is essential if any form of economic activity is to be sustainable.

Competitive advantage is essential if businesses are to establish and maintain a market position, which also translates into profitability. This principle advocates competitiveness in pricing, quality and (in the case of green productivity) "eco-friendliness".

Where green productivity is practised, the integration of environmental and productivity improvement will create new business opportunities and provide competitive advantage in a market where "quality" has been the focus. Extending this concept to include environmental quality is shared by the global consensus behind the ISO 14001 international management standard. Among the tools available under the umbrella of green productivity, ISO 14001 is especially valuable for bringing about internal management improvements that align environmental performance with quality, and as a way to communicate these improvements to others using a globally accepted model. The importance of ISO 14001 as a purchasing criterion and a passport to trade is increasing.

As in the case of the quality revolution, when businesses eventually realized that (apart from cost reduction quality) quality could increase profitability, the advantages of integrating environmental protection into business strategies will be realized with the practice of green productivity.

Information-driven improvement is of basic importance

Green productivity helps stimulate progress within an enterprise by transferring knowledge and building confidence. People-building or employer orientation is crucial at two levels:

- the commitment of top management, since these are the people responsible for setting companies' resource allocation priorities and for motivating and encouraging employees. A prerequisite of successful adoption of green productivity in business is employer (top management) commitment to "green" as a value-adding foundation;
- worker involvement in the practice of green productivity.

APO's green productivity action programmes

The three key activities used by the APO to promote and disseminate green productivity through its member economies are described below.

The *Green Productivity Promotion Mission (GPPM)* supports the acceptance of green productivity as a strategic, high-level management goal. Deputized experts spread awareness of the importance of green productivity among top-level government officials, business executives and other environmental stakeholders. More specifically, GPPM seeks to promote partnerships in member economies by creating close working relationships among national productivity organizations (NPOs) and environmental agencies in the public and private sectors. The local network promotes green productivity, helps member economies identify major problem areas, and assists in choosing options for green productivity implementation.

The *Green Productivity Demonstration Programme (GPDP)* helps NPOs establish demonstration projects at a factory, farm, community or service enterprise to demonstrate that environmental protection and productivity improvement can be profitably harmonized, even in the case of smaller enterprises. In particular, it shows how green productivity increases productivity while reducing environmental impact – without the need for substantial financial investment. It emphasizes doing better with less. The experience and lessons gained from demonstration projects are disseminated to other APO member economies for their information and application, thus multiplying the number of environment-friendly factories, farms, communities and service enterprises in the region. A critical component of a demonstration programme is building the NPOs' organizational capacity and capabilities, which in turn promotes and supports green productivity activities. So far, the APO has implemented GPDP projects with a high degree of success in:

- the tannery, metal plating, printing, precision tools, dye manufacturing and fruit canning industries;

- livestock raising and crop farming;
- community based improvement projects.

Green Productivity Dissemination Assistance (GPDA) allows the benefits of experience and information gained from demonstration programmes to be leveraged among member economies. The main purpose is to promote further awareness of green productivity and to create a domestic pool of experts in conjunction with NPOs. These local green productivity experts help amplify success in enterprise and community development. The opportunity to develop a competitive advantage through cooperation is a strong attraction to other businesses. Lessons learned from a peer or like-minded entity makes possible a chain reaction: projects initiated with GPDA foster success.

The following activities support the three-pronged programme described above.

The APO arranges for green productivity experts to provide advisory services in member economies according to specific needs. At the APO we also regularly prepare and disseminate various publications and multimedia materials related to green productivity to all who are interested. The APO's green productivity home page *(www.apo-tokyo.org)* is yet another channel by which green productivity information is disseminated to green productivity stakeholders throughout the world.

International cooperation

The APO maintains close links with other international and national entities to enlarge the knowledge base on subject areas important to APO member economies. Liaison with these organizations enables collaboration and extends the network of sourcing experts who could take part in the technical expert scheme. This enables the parties involved to promote solutions to matters of common interest and concern. Countries that have already joined us include Australia, Canada, France, Germany, the Netherlands and the United States.

Moreover, the APO works to diffuse knowledge, empower change and (in cooperation with other agencies around the world) heighten the receptivity of markets to green productivity as a means of fostering sustainability.

Demonstration projects

To demonstrate empirically that environmental protection and improvement in productivity can be profitably harmonized, even in SMEs, the APO has been implementing green productivity demonstration projects in industry, agriculture, the service sector and communities throughout its member countries where green productivity implementation will have a "multiplier effect".

So far, the APO has implemented over 25 such projects in member economies, including in the metal finishing, textile, tannery, food canning, cement, sugar, vegetable farming, poultry and pig farming sections as well as in communities. The success stories of these green productivity demonstration projects are available on the APO website.

One example is a demonstration project in Indore, India (also see box on next page). Following a green productivity training workshop in Indore in May 2000, the APO became aware of the potential for productivity and environmental improvements at the Oil Division of Rama Phosphate Ltd. (RPL). It therefore decided to support a green productivity demonstration project (GPDP) there in 2001, carried out by the National Productivity Council (NPC) in New Delhi.

The APO provided financial support for local experts, monitoring and laboratory analysis, and dissemination of project results using technical manuals, videos and seminars. A number of international experts (from Japan, Malaysia, Singapore, and the United States) were deputed by the APO to work with the demonstration site and to help identify green productivity improvement opportunities using appropriate feasibility studies.

NPC provided the necessary technical expertise on green productivity and ISO 14001, as well as necessary logistical and administrative support. The Madhya Pradesh State Pollution Control Board (MPPCB) and the Soybean Processors Association of India (SOPA) supported the project by serving as steering committee members.

RPL shouldered the cost of the hardware required, in line with recommendations of both international and local experts.

Having conducted preliminary surveys of project site operations, the possibilities and ways and means of improving pollution prevention and productivity were examined with respect to issues such as:

- reduction of water consumption and waste water generation;
- reduction of chemical consumption and resource inputs;
- recovery and recycling of intermediary processed materials;
- substitution of chemicals with more eco-friendly chemicals;
- cleaner work environment;
- increased yield;
- improvements in product quality.

RPL invested US$ 500,000 of their own resources to implement a number of green productivity options. Installation of a new boiler has helped improve the process parameters and hence quality. Recovery of heat from flue gas has resulted in a reduction of coal consumption. By making changes in the process, the company has reduced oil loss in dried oil cake; hexane loss has also been reduced. The payback period for the entire investment was expected to be only 15 months.

The company has established an environmental management system to ensure continual improvement of its environmental performance. It recently achieved ISO14001 certification.

The bottom line

Green productivity is a successful strategy for innovating sustainability. It provides a practical method for creating value-added products and services that result in triple bottom line results. Communities benefit from economic development while improving environmental protection. The rewards it makes possible are quantifiable, demonstrating a method for obtaining a better quality of life.

Too often the apparent dilemma of environment versus development boils down to arguments about who will pay. Valuable time and resources may be absorbed in fruitless banter. The truth is that we all pay when inappropriate action is taken, or when indifference leads the way. The APO has demonstrated that green productivity puts an end to this dilemma, replacing those "who pay" by those who profit and prosper. With the support of our countries, corporations and citizens, we can progress green productivity from triggering innovative ideas to becoming a full innovation – where environmental protection nets prosperity.

The business of managing the planet for prosperity demands a balanced approach between good governance, profitable enterprise and quality of life. More often than not, people will pay for quality when the choice is offered. As more businesses understand that there is profit in improved environmental performance, and that there is a competitive advantage in offering green products and services, a demand-side market will pull sustainability forward.

Governments have an important role to play in supporting this transition. We need to set a good example by our own actions – with supportive policies, sensible laws and appropriate financial incentives. With the results that green productivity has already produced, the conceptual dare for business and politicians has become a carrot leading to competitive advantage and poverty alleviation. Green productivity builds political will, community confidence and profit-oriented results.

There are signals that supporting market driven approaches will pay off.

Cooperative competition (in theory and in practice) can reduce costs and spread economic development opportunities. We need to cooperate beyond our traditional borders to bring competitive advantages to local communities, a market driven variation of the "think globally, act locally" mantra.

We need to send a powerful message to the market that natural capital must be integrated into pricing. We should move our money and our management decisions upstream and recognize the true costs of inefficiency. As governments, we must make policy decisions that overcome barriers to change; our policies must support "watershed economics". By adopting green productivity in national policy, we can take action to foster greener innovation.

Looking beyond WSSD

We at the APO do not suggest that we have won the war on waste in any form. However, the results of green productivity have enabled enterprises that dared to think beyond compliance to obtain competitive advantage.

Greening productivity changes the pace of the marathon. The stakes involved are enormous. We have everything to gain, but we risk losing all if we do not enter the race.

Just as profit is the carrot that tempts enterprises to improve productivity, governments must run in parallel to help enterprises in the race for the carrot and innovate sustainability.

Strategically, we must:

- encourage countries to adopt green productivity in policy and governance measures, and position green productivity to support sustainability through innovation. This includes removing barriers and subsidies that continue to degrade the environment and undermine productivity improvements;
- institute comprehensive market based instruments to encourage sustainability, pulled by the marketplace and pushed by regulatory measures to accelerate the shift to sustainability;
- increase cooperative alliances with public and private sector partnerships, to enhance diffusion of green productivity. The APO's initial experience with leveraging green productivity with integrated community development indicates that green productivity has great potential with respect to poverty alleviation;
- leverage experience with community economic development and green productivity to other countries as a means of promoting global trade that is sustainable;
- facilitate cooperation between labour and management to introduce cleaner technologies and improve working conditions;
- remove barriers to adoption of sustainable practices by micro-enterprises and SMEs through helping them adopt green productivity.

Systematically, we must:

- create an inventory of green productivity information and a database of results;
- assess the impact of green productivity on global trade and environmental issues;
- expand green productivity into service sectors (e.g. green tourism) and urban settings to alleviate poverty;
- facilitate development of green supply chains at all levels of government and in business clusters, including development of eco-industrial parks to enhance synergies between enterprises;
- focus green productivity activities on product redesign and completely new innovations to foster organic farming;
- improve consumers' ecological literacy, so that they understand the power and rewards of green consumerism and apply this power;
- promote the adoption of ISO 14001, recognizing its role in the greening of supply chains and as a passport to trade.

The message is simple: promote green productivity as a sensible strategy to innovate sustainability for triple bottom line returns and economic development, thus alleviating poverty.

Green productivity has achieved substantial, tangible results in less than a decade. The APO is proud to have contributed towards realizing the goals and visions of Agenda 21 by bringing sustainability "down to earth". It will continue this progress in the Asia-Pacific region and, through cooperation, extend green productivity to accelerate a growing green global marketplace.

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Green productivity demonstration project in India's edible oil industry

India is the fourth largest oilseed producing country in the world (after the United States, China and Brazil). It harvests about 25 million tonnes of oilseed per year. The edible oil sector occupies a distinct position in Indian economy, as it provides jobs to millions of people, achieves an average annual domestic turnover of about US$ 10 billion and earns foreign exchange of US$ 90 million per year. Soybean is the third largest oilseed crop in India after groundnut and mustard, accounting for 25% of total oilseed produced. Soy oil contributes about 10% of total vegetable oils produced.

In addition to this sector's economic importance, edible oil processing industries have been identified as one of the most polluting sectors in India. Processing soy seed to produce oil generates substantial amounts of water pollutants, gaseous emissions, and hazardous as well as non-hazardous solid wastes. As the soy oil processing industry is water and chemical intensive, it significantly impacts the environment.

With a view to enhancing productivity and environmental performance in the edible oil sector, Rama Phosphate Ltd. (Oil Division) of Indore, India, a soy oil processing industry, was selected for a green productivity demonstration project (GPDP). The unit studied has the capacity to process up to 500 tonnes/day of soy seed, extract up to 500 tonnes/day of solvent and refine up to 100 tonnes/day of oil. It also produces by-products such as de-oiled cake (DOC) and acid oil.

The green productivity methodology was applied to identify problems and their causes and effects, using green productivity tools and techniques (e.g. eco-mapping, concentration diagrams, control charts, fish bone diagrams and brainstorming). The major problem areas identified were losses of hexane and oil at the plant. Following identification and analysis of problem areas, the green productivity team focused on steam generation, supply and distribution as the top priority. Seed preparation was also identified as a major focus area. Based on brainstorming and discussions with top management and steering committee members, 36 green productivity options were generated. They were classified based on techniques/technologies and short-, medium- and long-term options. According to the technique/technology, the options concerned housekeeping, material substitution, recycling/reuse, recovery and technology (equipment modification and/or change) based options. All green productivity options were assessed for technical feasibility, economic viability and environmental acceptability.

Out of 36 green productivity options, 18 had been implemented by management as of January 2002. Management has invested about US$ 425,500 in implementing these options. The unit has achieved reductions in hexane loss of about 13% and in oil losses in de-oiled cake of about 20%. In recognition of this unit's efforts, the APO has presented an award to management. The unit has become ISO 14001 certified through adopting the green productivity approach. Management has received a best quality product award for the second year in a row.

The challenges of industrial development in Africa

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Summary
Developing Africa's industrial sector on a sustainable basis is vital to overcome the region's socio-economic and socio-ecological problems. This article reviews the contribution of the industrial sector to African economies and highlights the principal challenges to sustainable industrial development. Possible contributions of institutions promoting cleaner production to meeting the challenges of industrial development in Africa are discussed.

Résumé
Pour venir à bout des problèmes socio-économiques et socio-écologiques de l'Afrique, il est vital de développer le secteur industriel de la région sur des bases durables. Cet article fait le point sur la contribution du secteur industriel aux économies africaines et met en relief les principales difficultés que pose le développement industriel durable. Il explore la contribution possible des institutions qui encouragent la production plus propre pour relever les défis du développement industriel en Afrique.

Resumen
El desarrollo sustentable del sector industrial africano es imprescindible para resolver los problemas socioeconómicos y socioecológicos que enfrenta la región. Este artículo revisa el aporte del sector industrial a las economías africanas y señala los principales desafíos del desarrollo industrial sustentable. Se mencionan posibles contribuciones de instituciones promotoras de producción más limpia para enfrentar los desafíos del desarrollo industrial en Africa.

Despite numerous international and regional initiatives and interventions, Africa as a region has continued to show negative economic growth over the past two decades. It is true that in recent years indications of economic recovery in Africa have given grounds for renewed optimism both within and outside the region. This scenario of recovery, however, is fragile and its sustainability is in question. Not only has it not been underpinned by strong investment performance, but it has been highly vulnerable to external shocks including weather and the global terms of trade.

One of the major reasons for the failure of African economic growth is poor performance in the manufacturing sector (UNECA 1999). The performance of Africa's industrial sector has shown neither meaningful growth nor significant structural change over the past two decades. The average share of Manufacturing Value Added (MVA) in GDP fell from 13.4% in 1985 to 12.9% in 1998 (**Table 1**). If we look at the trend in low-income countries, the share of MVA in GDP increased from 16.4% in 1985 to 20.3% in 1998. Similarly, the share of MVA in GDP grew from 20.2% in 1985 to 22.9% in 1998 for middle income countries. In the case of high-income countries, the share of MVA in GDP decreased from 22.5% in 1985 to 21.2% in 1998. This could be explained by the shift in the industrial structure from manufacturing to services usually observed at the later stage of the industrialization process.

A low level of capacity utilization (30-50% on average) and extreme dependence on foreign inputs, expertise and exchange are the dominant characteristics of most African industry sectors. In general, the industrial sector in the region is very weak, contributing only about 1% to the world industrial output. Even that small contribution comes mainly from the 12 out of 53 African countries which more or less possess a relatively diversified industrial base. The remaining 41 countries contributed only 28% of the region's MVA (UNECA 1996).

In a nutshell, the manufacturing sector's contribution to sustainable development in Africa has been minimal. The significant slowdown in industrial growth in Africa, especially since the second half of the 1980s and the first half of the 1990s (associated with slightly declining rates of growth in GDP), reflects a changed structural relationship in the form of deindustrialization (UNIDO 1999). Manufacturing, which was the lead sector in fast-growing developing countries in Asia and Latin America, has been a lagging sector in Africa since the 1980s. In view of the central role of manufacturing industry in fulfilling African countries' sustainable development objectives, African governments and their international partners should put more effort into expanding the region's manufacturing sector on a sustainable basis.

Industrial development policies

Following the wave of independence in the 1950s and 1960s, newly emerged African governments recognized industrialization as the logical, preferred road to self-sufficiency and self-sustained growth. It was believed that the shift of labour and other resources from low-productivity agriculture to high-productivity manufacturing, and the development of linkages between enclave mining, energy or plantation agriculture and an emergent, modernizing manufacturing sector would create millions of new jobs while simultaneously raising living standards (UNIDO 1999). National industrial development policies and strategies have gone through different stages (**Table 2**).

An overview of regional development strategies promoted over the last few decades shows that three major groups of development strategies have influenced national industrial development policies in Africa (Mebratu 2000). The first group consists of strategies adopted and promoted by UN agencies based on the concept of the development decade. In parallel with these UN initiatives, a number of regional initiatives have been promoted by the Economic Commission for Africa (ECA) and the Organization of African Unity (OAU). The regional development initiatives were guided by the principles of the Lagos Plan of Action (LPA) adopted by the Summit of African Heads of States in 1980. The third major group of initiatives that has affected the course of events since the 1980s consists of the interventions made by the World Bank and the International Monetary Fund (IMF) in the economic policy-making of most African countries.

Although these initiatives have had limited success in terms of promoting industrial development in the region, they have provided a basis for understanding what kind of policy interventions do not work within the region. The following are some of the major lessons that could be drawn from the above initiatives (Mebratu 2000):

- *limitation of supply-driven initiatives*: development and promotion of "supply-driven" and "top-heavy" regional initiatives in the absence of the appropriate mechanisms, infrastructural foundations and sense of ownership at the national level has limited the possibility of success;
- *transformational rather than transplanting processes*: attempting to bring about industrial development by promoting economic reform packages under a "one-size-fits-all" model has lim-

ited success;

- *complementary roles of the market and governments*: experiences of successful industrialization in other regions over the last few decades indicate that government intervention supportive of market trends and competitive forces is vital to promote early stage industrial development;
- *industrial competitiveness as the key factor*: success in economic development depends on a country's ability to break into the virtuous circle of investment-economic growth-competitiveness-investment.

Table 1
Average share of MVA in GDP (economic groupings in Africa)

Developing countries	1985	1990	1995	1996	1997	1998
Low income	16.4	18.6	20.4	20.7	20.7	20.3
Middle income	20.2	22.1	22.8	23.0	23.5	22.9
High income	22.5	21.8	21.0	21.1	21.2	21.2
Africa	13.4	13.4	12.7	12.5	12.8	12.9

Source: UNIDO, *International Yearbook of Industrial Statistics*, 2001

Development priorities in the 21st century

The year 2001 was marked by a number of regional and international activities aimed at preparing Africa for the challenges of the 21st century. These activities underlined that poverty reduction has to considered the number one development priority for African countries. Linkages between poverty reduction and industrial development were reflected in all the major global and regional forums held that year. The third UN Conference on the Least Developed Countries in May 2001 emphasized the contribution of industry to poverty alleviation in the context of the Draft Programme of Action for the Least Developed Countries for the Decade 2001-2010.

At regional level, Africa took part in the preparatory process for the World Summit on Sustainable Development (WSSD) to be held in September 2002 in Johannesburg. The Regional Preparatory meeting jointly attended by African Ministers of Environment and Ministers of Economic Planning in October 2001 adopted an "African Common Position" under the triple theme "People-Planet-Prosperity". This position also underlined the importance of "promoting industrial growth, especially through small and medium-sized enterprises for poverty reduction".

The need to address the development challenge of African countries has received increasing recognition at the global level. This recognition is reflected by the inclusion of a separate section on "Sustainable Development for Africa" in the Draft Plan of Implementation for WSSD. That section stipulates the major actions that need to be taken to promote sustainable development in Africa.

The WSSD implementation plan includes actions aimed at (IIED 2002):

- enhancing African countries' industrial productivity, diversity and competitiveness;
- enhancing the contribution of the industrial sector, in particular the mining, minerals and metal industries;
- providing financial and technical support to strengthen African countries' capacity to undertake environmental legislative, policy and institutional reforms for sustainable development;
- achieving sound management of chemicals;
- bridging the digital divide and creating digital opportunities for access to infrastructure and technology transfer;
- supporting Africa's effort to attain sustainable tourism.

Apart from the WSSD process, African leaders have been actively engaged in developing an African development agenda for the 21st century leading to the adoption of the New Partnership for Africa's Development (NEPAD). NEPAD is based on the determination of Africans to extricate themselves and the continent from the malaise of underdevelopment and exclusion in a globalizing world. While a number of priority issues are covered under NEPAD, development of the private sector, diversification of Africa's industrial base, improvement of the efficiency and competitiveness of its industries and better access for African products in the global market are some of the NEPAD priorities that have direct relevance to African industries. Furthermore, NEPAD identifies the development of business incubators as one of the key projects through which African countries can promote development of the private sector and industrial growth.

Major constraints and challenges

There are a number of constraints and challenges with respect to promoting sustainable industrial development in Africa. Some are related to global socio-economic trends, and others to regional socio-economic dynamics. The following can be cited as the principal challenges having significant influence on the promotion of sustainable development in Africa:

The impact of globalization

Globalization has been less favourable to Africa than to other developing regions. It has created a divergence in living standards compared with those of developed countries and the fast-growing industrializing countries of East and South-East Asia. Africa's failure to penetrate international markets for manufactured goods highlights the region's vulnerability to globalization. To make things worse, existing manufacturing industries are increasingly going out of business (even on the national market) due to their inability to compete with imported industrial products from other countries through the liberalized trade regimes. The African experience shows that globalization – in the form of trade and investment liberalization – without commensurate enhancement of domestic manufacturing capacity leads to marginalization.

Regional cooperation and integration

Regional integration has served as one of the major vehicles for sustained economic growth over the last decades. Unfortunately, Africa's "speed of integration index" was negative between 1961 and 1990. In the 1990s it averaged 0.9 annually, compared with 6.0 for low and middle income regions as a whole (UNIDO 1999). The low level of regional integration could be further aggravated by the emerging knowledge economy and the digital divide reflecting the increasing role of ICT in national and global economies.

Transfer of environmentally sound technologies

Development of industrial skill and technological capability is the basic prerequisite for African countries to advance their industries on a sustainable basis and participate effectively in the global economy. In recognition of this fact, the transfer of environmentally sound technologies to the developing world has been identified as one of the major elements of the global agenda for the 21st century (Agenda 21). However, the rate of technology transfer to African countries is still lagging and most industrial production systems are still based on obsolete and inefficient production technologies.

Linkages between trade, environment and development

Progress towards sustainable production and consumption will involve redefinition of the linkages between trade, environment and development. The redefinition process, mainly driven by industrialized countries' consumer preferences, has

Table 2
Evolution of African industrial policy, 1960-2000

1960-79	1980-95	1995-2000
• intervention and regulation	• market orientation and deregulation	• industrial governance
• self-sufficiency and indigenization	• foreign direct investment (FDI)	• privatization and FDI
• public ownership	• privatization	• public-private sector cooperation
• import controls and tariff protection	• trade and investment liberalization	• promotion of clusters
• inward-driven industrialization	• outward orientation	• supply-side support from SMEs
• industrialization to achieve structural transformation	• promotion of efficient industries	• global competitiveness

Source UNIDO, *African Industry 2000: The Challenge of Going Global*, 1999.

already started. The shift towards sustainable production and consumption is considered to lead to multiple socio-economic and socio-ecological benefits. On the other hand, it could also be perceived as an instrument of "environmental protectionism" by countries that lack the necessary capacity to identify and exploit emerging opportunities.

Possible contribution by cleaner production promoters

It has been almost a decade since the concept of cleaner production was introduced in some of the African countries. Cleaner production (or pollution prevention) programmes supported through bilateral funding agencies were the early promoters of the concept in the region. In some African countries professional societies and business associations have played a major role in promoting cleaner production. These efforts have been further strengthened by the establishment of UNIDO/UNEP supported National Cleaner Production Centers (NCPCs) in eight African countries (UNEP 2002).

Today cleaner production has some form of institutional base in most African countries and the concept is incorporated in the curriculum of some African universities. Nevertheless, a lot remains to be done in terms of making cleaner production programmes and interventions responsive to the continent's industrial development challenges.

Overcoming the industrial development challenges discussed earlier would require reorienting development policy formulation and implementation practices at the global, regional and national levels. Institutions engaged in promoting cleaner production could be well-positioned to provide targeted support services that enabled African countries to meet the challenges of supporting industrial development on a sustainable basis. The following are among the major areas that might be considered by those promoting cleaner production:

- Enhance the industrial productivity and competitiveness of African manufacturing industries through combining appropriate economic instruments and technological support services.
- Develop national export promotion strategies through eco-efficient production and assist their implementation by mobilizing targeted technical and financial support to export industries.
- Support industries in moving beyond the good housekeeping benefits of cleaner production by establishing national financing mechanisms for the transfer of cleaner and more energy efficient technologies.
- Identify niche markets where African companies may have comparative advantages and promote the development of products for the identified markets.
- Develop and implement different national and regional labelling programmes based on striking a dynamic balance between trade, environment and development.
- Promote the incorporation of eco-industrial planning principles in the development of industrial estates and industrial zones by providing training on eco-industrial planning for industrial planners, estate developers and industrial policymakers.
- Provide technical support services for the implementation of multilateral environmental agreements (MEAs) and use them as a vehicle to promote sustainable industrial development.

Conclusion

Despite the overwhelming challenges Africa faces, it has considerable potential that can be transformed into the fruits of sustainable development, benefiting its people and the whole world. This depends on African governments standing up to the leadership challenges of creating an enabling environment, and on global partners providing the necessary technical and financial support to integrate Africa into the global economy. It is hoped that regional initiatives like NEPAD (as an expression of the collective will and determination of African governments) and the WSSD implementation plan for promoting sustainable development in Africa will provide a useful framework for promoting sustainable development in the region. In this context, institutions involved in the promotion of cleaner production in Africa could make a significant contribution to the regional effort by reorienting their activities towards targeted interventions that enhance the competitiveness of African industries in the global market.

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Helping small and not-so-small businesses improve their triple bottom line performance

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Summary
To sustain their market position, SMEs need to increase their efficiency. However, they often lack the time, money and information to carry out an adequate evaluation of their own activities, set targets, and thus continuously improve products and services (economically, socially and environmentally). The complexity of existing international environmental management schemes is frequently inappropriate for use by SMEs. Cooperation among information "gatekeepers" at various levels is necessary to raise awareness of environmentally and socially sound production patterns among SMEs, provide them with hands-on tools for integrating environmental and social concerns in day-to-day business, and establish economic conditions that reward such efforts.

Résumé
Pour conserver leur position sur le marché, les PME doivent devenir plus efficaces. Or elles manquent souvent de temps, d'argent et d'informations pour évaluer leurs propres activités, se fixer des objectifs et améliorer ainsi en permanence leurs produits et services (sur le plan économique, social et environnemental). Les schémas internationaux actuels de gestion de l'environnement sont la plupart du temps trop complexes pour que les PME puissent les appliquer. Il faudrait une coopération à différents niveaux entre ceux qui contrôlent l'accès à l'information pour faire connaître aux PME les modes de production écologiquement et socialement acceptables, leur fournir des outils pratiques pour intégrer les préoccupations environnementales et sociales dans leurs activités quotidiennes et créer des conditions économiques qui récompensent ces efforts.

Resumen
Las PYMEs deben incrementar su eficiencia para mantener su posición de mercado. Sin embargo, por lo general carecen de tiempo, dinero e información suficientes para evaluar sus propias actividades, fijar metas, y en consecuencia trabajar para la mejora progresiva de productos y servicios (desde el punto de vista económico, social y ambiental). La complejidad de los programas internacionales de gestión ambiental existentes generalmente los vuelve inapropiados para las PYMEs. Se requiere colaboración entre "generadores" de información a distintos niveles a fin de promover un cierto grado de conciencia sobre la importancia de patrones de producción ambientales y sociales sólidos entre las PYMEs, suministrar las herramientas necesarias para la integración de problemáticas ambientales y sociales durante el desarrollo del negocio, y establecer incentivos económicos para recompensar dichos esfuerzos.

To move towards sustainable development, businesses – like all other actors in society – must rethink their behaviour. In this case, companies start from various stages of development and corporate culture with respect to environmental and social issues (**Figure 1**).

The phases distinguished in the figure can be summarized as follows:[1]

◆ In the output-oriented *Phase 1*, the management emphasis is on outputs rather than on processes. Here errors are noticeable after they have been made. Companies in this phase can be labelled reactive with respect to the environment.

◆ Process orientation is a characteristic element of *Phase 2*, in which the focus has been placed on the production process and its management. Here major mistakes can be corrected based on measurements and knowledge of processes.

◆ During the system-oriented *Phase 3*, the entire organization including support processes and their management are the focus of performance improvement measures. In this phase a system is established that controls production processes and aims at preventative measures, including corrective actions if mistakes occur.

◆ In contrast to the previous phases, which are focused internally, the emphasis of the chain-oriented *Phase 4* is on external effects within the market, whereby companies relate their whole organization to other parties in the product system. In a cooperative way, win-win situations are created for the entire chain.

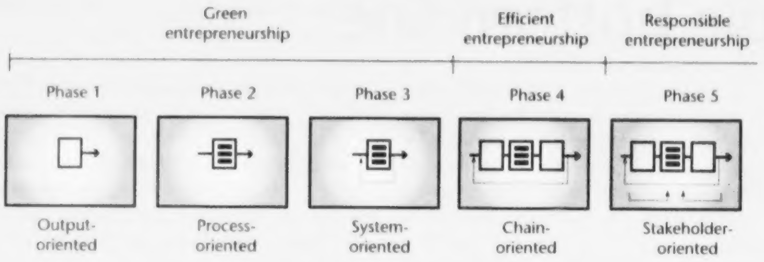
◆ At the stakeholder-oriented stage (*Phase 5*) companies base their vision and policy on stakeholder expectations, demonstrating a sense of responsibility towards society.

The order of the different phases – from green to (eco-)efficient and then to responsible entrepreneurship – seems to be the path followed by most companies heading towards sustainable development. Often companies begin by addressing internal environmental issues (and realizing cost-saving potentials through internal environmental management). Subsequently they start looking beyond their companies' boundaries to address environmental issues in the product chain and then, further along, to include stakeholders such as the community and NGOs.

Larger companies with potentially more stakeholders are likely to attain Phases 4 and 5 after going through the first phases, especially if they are in a mature and stable industry sector with obvious environmental, health and safety impacts. However, as explicitly stated in Klinkers et al.[2] it is not necessary to focus first on internal environmental management before taking steps into the chain. Companies can potentially bypass the first phases and start directly with, for example, Phases 3 or 4.

Many SMEs remain at an early stage of environmental management. However, due to increased pressure from customers (mainly public procurement agencies), central wholesale organizations or industrial companies within the product chain and authorities, environmental and social concern is gradually increasing. In business-to-business customer relationships, information demand is heightened regarding general environmental and social management, use of environmentally and socially sound technologies, and products' environmental and social impacts during their life cycle. Assisting SMEs in improving their economic, environmental and social (or triple bottom line – TBL) performance will be the challenging task of information "gatekeepers" on the international, national, regional and – especially – local level.

Figure 1
Phases of sustainable business development



Source: adapted from Klinkers, et al., 1999

Why target SMEs? The importance of SMEs from the macro-perspective

SMEs make up the most important sector of a country's economy. They provide employment and opportunities for millions of individuals; their work is strongly customer-oriented; they are a source of innovation and entrepreneurial spirit; they create competition and are the seed for businesses of the future.[3] The world-wide contribution of SMEs to economic development is significant. In the EU, for example, about 90% of all enterprises are SMEs and they account for 70% of all economic activities. In developing countries the economic importance of SMEs is similarly high. The number of SMEs is growing due to the global trend of larger enterprises to reorganize, downsize and outsource, as well as to increased franchising and self-employment.

SMEs' relative contribution to total industrial environmental impacts is unknown, but collectively their sheer numbers may mean that these impacts on the ecosystem could be substantial. SMEs commonly dominate resource and emission intensive sectors such as metal finishing, leather tanning, dry cleaning, printing and dyeing, brewing, food processing, fish farming, textile manufacturing and chemical production.[4]

Some SMEs have already taken the lead in managing their environmental and social impacts in a well-structured way. They have environmental management systems in place, report on their environmental and social performance, train and qualify their staff with respect to environmental and social impacts, and work in cooperation with other firms along the supply chain to reduce the environmental impacts of products and services. However, the majority of SMEs (especially those in developing countries and countries in transition) are still characterized by lack of awareness of their own environmental and social impacts and by their less structured management of such issues. Current policy approaches appear not to affect this majority, and support organizations fail to reach them. For the benefit of the environment, and in a wider societal context, SMEs still need to be engaged in the drive towards sustainability. To cite a few examples, they are an essential contributor to reaching reduction targets set in the Kyoto Protocol to the UN Framework Convention on Climate Change or to reaching policy targets like "Factor 4/10".[5] As they are often mobile, flexible and extraordinarily innovative, they are critically important to the implementation of cleaner products and services and to putting into practice instruments such as the International Declaration on Cleaner Production and Integrated Product Policy (IPP).[6]

Raising awareness in SMEs of environmental and social impacts and related economic inefficiencies, as well as encouraging them to become involved, means considering the conditions under which they operate, as will be examined below.

Why target SMEs? Taking care of difficulties on the micro-level

SMEs are highly important in defining product chains for future demands. Product chain actors are interested in having reliable, flexible and innovative partners that produce high quality, environmentally sound products. An integrated management system including TBL performance measures can help improve business-to-business customer relationships along the chain, reduce risks resulting from external effects and inefficiencies, and reduce costs. However, as described above, only a few SMEs have already taken voluntary action towards TBL performance improvements. There has been considerable discussion on the internal and external barriers SMEs face in doing so.[7] Most SMEs perceive environmental improvement as a costly burden. As they are primarily concerned with short-term economic survival, they are not motivated to ask for – or use – environmental information or support.[8] SMEs often lack the time, information and money they need to improve matters. In addition, smaller manufacturing companies often do not have staff whose environmental knowledge and expertise are adequate to address problems and opportunities in the environmental field. International environmental management schemes are often too complex for them to handle. Once an SME has begun to implement an environmental management scheme, the process is frequently found to be unexpectedly expensive and is therefore often interrupted.

The Environmental Management Navigator

The Environmental Management Navigator serves as a guide and decision support concept to help corporate decision-makers cope with the growing demand and expectations in the field of environmental management.

The *Navigator* aims to:

- empower corporations by giving them an understanding of the beneficial impact that environmental management tools have on the bottom line;
- present basic knowledge about such tools in a comprehensive and understandable fashion;
- enable corporate decision-makers to apply these tools appropriately.

The *Navigator* was developed on behalf of Carl Duisberg Gesellschaft by the Eco-Efficiency and Sustainable Enterprises Team at the Wuppertal Institute, UNEP DTIE, and the United Nations Industrial Development Organisation (UNIDO).

For more information, see www.em-navigator.net.

Generally, the number of EMS certified companies is still low. For example, in Germany (ranking second in certifications for ISO 14001 and first in EMAS registrations), less than 0.2 % of all companies are currently EMAS certified. According to Keddie,[9] the reasons for low acceptance of EMS include the complexity of the certification processes, a perception that systems are irrelevant or ill-suited to most companies' needs, competition with other demands on managers' time and resources, and the lack of credibility of government campaigns to encourage adoption.

Incidentally, some studies identify disadvantages of implementing a certified EMS (**Figure 2**). These disadvantages can be grouped into three categories:

- substantial human and financial resource requirements;
- lack of rewards;
- unexpected effects.

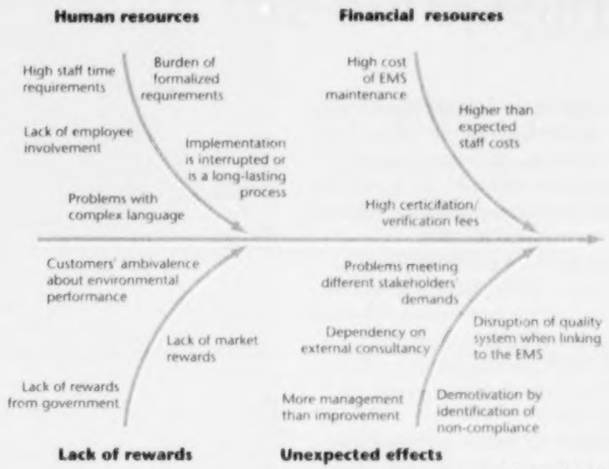
Internally, the human and financial resources required are major disadvantages (e.g. based on such aspects as the burden of formalized requirements or the substantial costs of EMS maintenance). Moreover, lack of market or governmental rewards, unexpected effects such as dependency on external consultants, or problems with meeting various stakeholder demands can be disadvantageous to a company.

Consequently, it becomes evident that SMEs need more pragmatic and appropriate assistance. The specific conditions existing in SMEs need to be taken into account. Effective information exchange is crucial to providing SMEs with hands-on support tools that help to integrate environmental and social affairs in day-to-day business practices and establish economic framework conditions that reward these efforts.

Who can target SMEs? The networking idea: users, partners and suppliers

Whether large or small, environmentally oriented action does not happen in isolation. Networks concerned with TBL performance improvement are important for the different streams of information and support they provide the company. SMEs have to gain a balance of ideas, information, technological options and financial power to move towards TBL performance improvements. Networks are essential for SMEs. Owners and managers of small firms are less likely than their counterparts in larger firms to have formal management training and may be less familiar with the analytical techniques associated with strategy formulation and decision-making that underpins TBL performance improvements. Therefore, the importance of disseminating appropriate information as a primary strategy for encouraging the greening of SMEs is virtually unchallenged. In a meeting of experts specialized in communication of environmental information to enterprises (particularly SMEs), the model in **Figure 3** was compiled to explain how companies currently receive information.[10] One conclusion has been that information efforts that do not take this flow into account are likely to be less effective or influential.

Figure 2
Disadvantages for SMEs of implementing certified EMS


Human resources
Financial resources
High staff time requirements
Burden of formalized requirements
Lack of employee involvement
Implementation is interrupted or is a long-lasting process
Problems with complex language
High cost of EMS maintenance
Higher than expected staff costs
High certicifation/ verification fees
Customers' ambivalence about environmental performance
Lack of market rewards
Lack of rewards from government
Problems meeting different stakeholders' demands
Dependency on external consultancy
Disruption of quality system when linking to the EMS
More management than improvement
Demotivation by identification of non-compliance
Lack of rewards
Unexpected effects

Source: adapted from Hillary, 1999

Following this model, information campaigns are most effective in reaching SMEs when they use the existing information routes through local level information sources such as municipal authorities, business organizations, business partners of SMEs, Rotary Clubs and local chambers of commerce. Campaigns directed at industries, especially SMEs, via other information routes at the international level, for example, do not have an equal chance of succeeding. To urge SMEs worldwide to invest in local and regional networks where no information routes exist, and to inform existing networks in which SMEs participate, a diverse set of information "gatekeepers" on the international, national, regional and *especially* local level is required. Partners that need to get involved are trade associations, employer associations, business associations, direct business partners of SMEs, chambers of commerce, authorities, training institutions, academia, insurance companies and banks.

The financial sector has a crucial role to play in TBL uptake. Banks and insurance companies that have signed the UNEP Statement by Financial Institutions on the Environment and Sustainable Development make a commitment to work cooperatively, within the framework of market mechanisms, towards common environmental goals and to pursue best practice in environmental management, including energy efficiency, recycling and waste reduction. Furthermore, they will seek to form business relations with partners, suppliers and subcontractors that follow similarly high environmental standards. Stimulation of TBL improvements among SMEs can help implement the Statement. In return for companies' efforts to work on their TBL, they could have a better standing when environmental risks are taken into account – especially in regard to loans and investments.

However, as SMEs (like industry in general) prefer to receive information business-to-business, the most effective way of disseminating TBL information is through existing information channels such as local business organizations and supplier chains. The reputation of large companies, the success of international voluntary and business initiatives, and the commitment to continuous improvement in environmental management systems are closely related to SMEs. The poor environmental performance of SMEs within the supply chain will negate the environmental success of large partners.

Using their influence, larger companies (as well as governmental organizations) might promote TBL improvements in SMEs through taking the following measures:

- developing purchasing policies that reward corporate performance improvements and collaboration (not only EMS certified). If an EMS is required (e.g. in the automotive industry most enterprises are forced by the competitive market to have EMS certification), SMEs' implementation of an EMS should be given support. In developing an effective support mechanism for SMEs, cooperation all along the supply chain plays a fundamental role.

These measures could be taken by larger companies to promote environmental improvements in SMEs:

- incremental approaches to implementation, with potential rewards;
- incremental certification, with certificates issued at every step;
- joint EMS and group certifications;
- mentoring by larger companies.

In broad terms, sustainable development depends upon cooperation within a dynamic SME sector that is environmentally and socially aware.

Conclusions

The information and tools provided to SMEs should be designed specifically to meet their needs. The nature and extent of the TBL performance information needed by SMEs depends on their level of interest and the strategic level of the decision. Broad distinctions can be made by taking the following into account:

- compliance with legislation and agreements made between parties (environmental legislation, covenants, international treaties);
- market-oriented considerations (competitive advantage, pressure from customers);

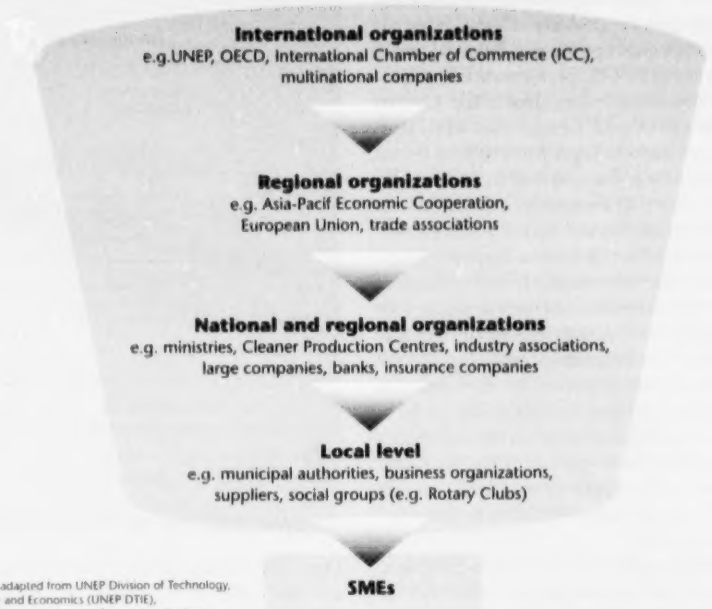
The Efficient Entrepreneur

UNEP's Division of Technology, Industry and Environment (UNEP DTIE) and the Wuppertal Institute's Eco-efficiency and Sustainable Enterprise Team in Germany have jointly developed *The Efficient Entrepreneur – A calendar for small and medium-sized enterprises* to assist SMEs facing situations in which customers and authorities are increasingly becoming concerned about enterprises' environmental and social performance. In conjunction with an additional booklet (*The Efficient Entrepreneur Assistant*), the calendar enables businesses to quantify consumption of energy, water and raw materials, production of pollution (such as waste, air and water emissions and noise), as well as areas for cost-cutting and improving customer satisfaction. The calendar charts a "month-by-month" programme that concludes with a simple SME efficiency report. The *Efficient Entrepreneur* calendar is relevant to any SME-type firm, and to any firm or department requiring an introduction to environmental performance measurement and communication (e.g. in preparation for ISO 14001 or EMAS implementation).

For more information, see www.efficient-entrepreneur.net.

- pro-active economic considerations (waste reduction, cost-effectiveness, anticipation of future policy measures, environmental liability);
- ecological/societal considerations (aiming at sustainable development).

Figure 3
Levels at which SMEs can be reached


International organizations
e.g.UNEP, OECD, International Chamber of Commerce (ICC), multinational companies
Regional organizations
e.g. Asia-Pacif Economic Cooperation, European Union, trade associations
National and regional organizations
e.g. ministries, Cleaner Production Centres, industry associations, large companies, banks, insurance companies
Local level
e.g. municipal authorities, business organizations, suppliers, social groups (e.g. Rotary Clubs)
SMEs

Source: adapted from UNEP Division of Technology, Industry and Economics (UNEP DTIE), Developing better systems for communicating environmental best practice in business - final report, 1997

Notes

1. For more details on the different phases, see L. Klinkers, W. van der Kooy and H. Wijen, Product-oriented environmental management provides new opportunities and directions for speeding up environmental performance, *Greener Management International* 26, 1999.
2. Klinkers, van der Kooy and H. Wijen, *op cit.*
3. R. Hillary (ed.) (2000) *Small and Medium-Sized Enterprises and the Environment – Business Imperatives*, Greenleaf Publishing, Sheffield, UK.
4. J. Hobbs (2000) Promoting cleaner production in small and medium-sized enterprises. In: R. Hillary (ed.) *op. cit.*
5. *Factor 4/ Factor 10: Sustainability objectives*, introduced by E. Weizsäcker, A.B. Lovins and L. Hunter Lovins: *Factor Four Doubling Wealth – Halving Resource Use*, Earthscan Publications Ltd., London, 1997; and *The Factor Ten Club: The Carnoules Declaration – Statement to Government and Business Leaders*, Wuppertal Institute for Climate, Environment and Energy, Wuppertal, Germany, 1997.
6. European Commission (2001), Green paper for the integrated product policy, Brussels.
7. See, for example, R. Hillary (ed.), *op cit.*; KPMG Environmental Consulting, *The Environmental Challenge and Small and Medium-sized Enterprises in Europe*, The Hague, 1997; J.Q. Merritt, EM into SME Won't Go? Attitudes, Awareness and Practices in the London Borough of Croydon, *Business Strategy and the Environment* 7, 1998, pp. 90-100.
8. UNEP Division of Technology, Industry and Economics (UNEP DTIE) (1997) *Developing better systems for communicating environmental best practice in business – final report*. Paris.
9. Keddie, A. (2000) Thinking and Communicating in Business Terms. Presentation at the International Workshop on Business, Eco-Efficiency and Sustainable Development: The Role of Environmental Management Tools, Lisbon, 1-3 March 2000.
10. UNEP DTIE, *op. cit.*

◆

Developing a system of sectoral sustainability indicators for the European aluminium industry

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Summary

In 2001 the European aluminium industry commissioned the Wuppertal Institute to carry out a project called "Towards a Sustainable Aluminium Industry: Stakeholder Expectations and Core Indicators". The project's main purpose was to examine sustainability agendas and stakeholder expectations. A framework of indicators could then be established for use in measuring the industry's sustainability performance. Participating stakeholders are able to see the uses to which their input is being put. Experience developing this set of sectoral sustainability indicators demonstrates that the approach presented in this article can address major sustainable development themes.

Résumé

En 2001, l'industrie européenne de l'aluminium a sollicité les services du Wuppertal Institute pour mener à bien un projet baptisé « Vers une industrie durable de l'aluminium : Attentes des parties prenantes et principaux indicateurs ». Le projet avait pour objet principal d'étudier les programmes d'action en faveur du développement durable et les attentes des parties prenantes. Il a permis d'établir un ensemble d'indicateurs pour mesurer les performances de l'industrie en termes de développement durable. Les parties prenantes peuvent alors se rendre compte des usages qui sont faits de leurs contributions. Le travail concret d'élaboration de cet ensemble d'indicateurs sectoriels du développement durable a montré que la démarche décrite dans cet article permet d'examiner les grands axes du développement durable.

Resumen

En 2001 la industria europea de aluminio encomendó al Instituto Wuppertal el desarrollo del proyecto " Hacia una industria de aluminio sustentable: expectativas de sectores involucrados e indicadores centrales" ("Towards a Sustainable Aluminium Industry: Stakeholder Expectations and Core Indicators"). El objetivo principal del proyecto era examinar la sustentabilidad de las agendas y las expectativas de los sectores involucrados, a fin de establecer un marco de indicadores para medir el desempeño sustentable de la industria. Esto permite que los sectores participantes controlen la utilización de sus aportes. El proceso de desarrollo de este conjunto de indicadores de sustentabilidad sectorial demuestra que es posible aplicar esta misma propuesta a los principales temas de desarrollo sustentable.

The understanding of sustainable development that evolved from the 1992 Rio Conference assumes that environmental, economic and social aims are equally important. At the beginning of the 21st century, putting sustainable development into action remains a formidable challenge. It is important for companies and sectors to know what kind of targets and actions will lead to sustainability.

Within that context, the aluminium industry regards sustainable development as an ongoing search process – with components derived from the past, present and future. Committed to sustainable development, the industry has already taken proactive steps. This commitment comprises:

◆ identification with the basic principles of sustainability;

◆ contributions to environmental protection (combined with social and ethical behaviour) and to economic development;

◆ an open (internally and externally) information policy to establish confidence in the way the industry behaves, relying on maintaining a dialogue with all relevant societal groups and on carrying out this dialogue intensively at company and association level.

The industry's commitment is being realized through various activities, e.g. the design of programmes to reduce greenhouse gas emissions, establishment of environmental management systems, intensification of stakeholder dialogue programmes, investment in R&D for innovation, and employee training and education. Much has been done, but questions are continuously being asked within the aluminium industry itself with a view to understanding whether it is on a sustainable development path (**Table 1**).

In 2001, to obtain answers to questions such as these, the European aluminium industry commissioned the Wuppertal Institute to conduct the project "Towards a Sustainable Aluminium Industry: Stakeholder Expectations and Core Indicators".

Responding to the questions: designing a set of sustainability indicators

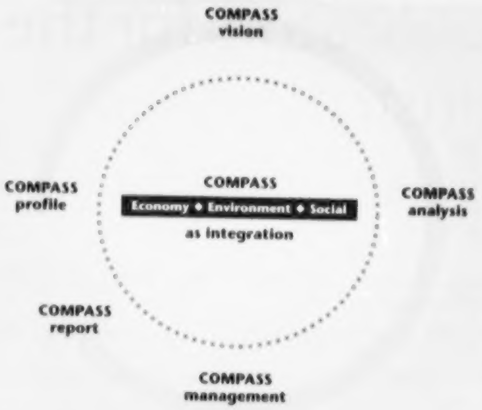
The Wuppertal Institute recognizes the need for decision-makers in business to provide transparent information on their sustainability performance to external stakeholders, as well as to maintain an internal information base concerning economic, social and environmental issues for evaluation and continuous improvement of companies' sustainability performance. A methodology called COMPASS (Companies' and Sectors' Path to Sustainability) was developed by the Wupppertal Institute's Eco-Efficiency and Sustainable Enterprises Team (Kuhndt and Liedtke, 1999). COMPASS, which helps companies and sectors manage their sustainability performance, was applied to a sector for the first time in the case of the European aluminium industry.

COMPASS has five elements (**Figure 1**):

◆ COMPASS$_{\text{profile}}$ aims at describing the state of knowledge on economic, social and environmental performance issues within a company/sector, as well as the expectations of different stakeholders regarding that company/sector.

◆ COMPASS$_{\text{vision}}$ helps develop a sustainability vision for the company/sector and define goals and targets.

Figure 1
Elements of COMPASS



Source: Kuhndt and Liedtke, 1999

- ◆ COMPASS$_{analysis}$ assists in selecting a set of relevant indicators and explores "distance to target" using performance measurement and benchmarking.
- ◆ COMPASS$_{management}$ ensures translation of targets and indicators into decision-making processes by providing suitable management instruments.
- ◆ In COMPASS$_{report}$ a communication plan is prepared to help report on performance improvements and achievements to an internal or external audience, according to international standards and guidelines such as those provided by the ISO and the Global Reporting Initiative (GRI).

Since theoretical concepts like sustainability are abstract and broadly formulated, it is first necessary to specify their content. To do so, COMPASS uses "concept specification" or "dimensional analysis". This method is applied to break the concept of sustainable development down into dimensions, categories and aspects.

Categories and aspects are defined according to GRI methodology (**Table 2**). Identification of relevant dimensions, categories and aspects helps one understand a sector's main sustainability issues by "drawing a picture" of the sector-specific sustainability context. This picture serves as a basis for selecting appropriate indicators in the next step.

COMPASS has three core tools for use in identifying relevant categories and aspects of sustainable development within a sector:

- ◆ review of sustainability agendas;
- ◆ analysis of sectoral focus areas;
- ◆ consideration of stakeholder expectations.

Reviewing current sustainability agendas can provide an overview of the broader sustainability debate. Analyzing a focus area helps track sector-specific key issues. The results of agenda reviews and focus area analyses serve as essential input for considering the expectations of internal and external stakeholders.

Reviewing current sustainability agendas

Various sustainability agendas have been created by stakeholders (e.g. political institutions, consumer associations, NGOs, businesses) (**Figure 2**). Some of the main trends in policy and business agendas include:

- ◆ expanded application of economic instruments to environmental management;
- ◆ measures to encourage eco-efficient production patterns and corporate social responsibility;
- ◆ supply side and demand side management strategies;
- ◆ increasing public participation in business and policy development;
- ◆ information and public awareness programmes;
- ◆ product performance targets and policies, and guidelines for reporting.

Examples of international initiatives considered by this methodology are the United Nations Global Compact initiative, the OECD Guidelines for Multinational Enterprises, the Social Accountability International Standard SA 8000 (see *www.cepaa.org*), the ISO 14031 Standard on Environmental Performance Evaluation (see *www.iso/ch*), and the GRI guidelines designed to help businesses prepare sustainability reports (see *www.globalreporting.org*). For a more detailed description of the initiatives considered, also see Kuhndt, Geibler and Liedtke, 2002).

Focus area analysis of the aluminium sector

A focus area analysis is useful for completing more general information from the agenda review. The focus area analysis of the aluminium sector helped identify key sector-specific areas during the life cycle. The origin of specific focus areas might be based on common process technologies and related impacts, common framework conditions, and past, current or planned sustainability activities within the sector. The focus area analysis was part of the stakeholder survey, as described in the following section. The outcome of the survey is shown in **Table 3**. The aspects perceived by survey participants as the most important were considered in designing the sustainability indicators.

Consideration of stakeholder expectations

Considering stakeholder expectations can be an effective way to integrate a wider range of relevant aspects, actors and expertise into management decisions, so as to settle (or at least clarify) controversial questions before intensive planning begins.

In the case of the aluminium industry, the stakeholder survey was used as a starting point for stakeholder involvement. The survey's overall objective was to gather data on opinions and expectations from internal and external stakeholders concerning sustainability issues in the industry. The survey structure reflected this objective. It included three main areas:

- ◆ the importance of sustainability aspects, derived from the agenda review;
- ◆ the importance of sector-specific sustainability aspects, derived from the focus area analysis;
- ◆ the importance of different stakeholders to the sector.

To derive a balanced view from a wide range of stakeholder expectations, the survey addressed both internal stakeholders (representatives of companies and associations) and external ones (e.g. representatives of research institutions, governmental organizations, financial institutions, consumer organizations, environmental and social NGOs, the media and competitors). Survey participants were asked to evaluate, according to their perceived importance, sustainability categories and aspects identified in the agenda review and focus area analysis. **Figure 3** compares the types of infor-

Table 1
Types of questions related to sustainable development being asked within the aluminium industry

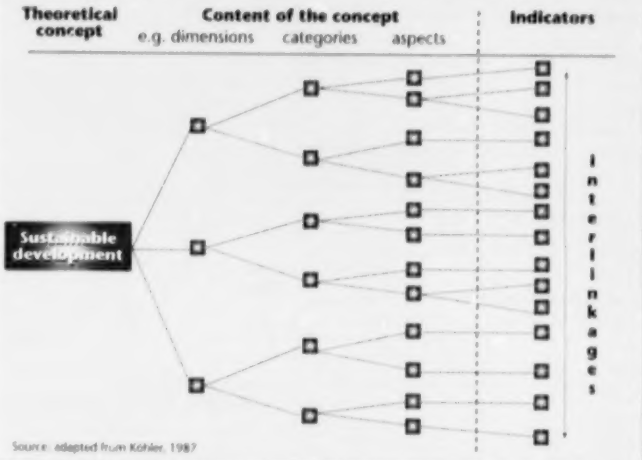
- ◆ What are current trends in the international sustainability debate?
- ◆ Which of these trends are relevant to the aluminium industry?
- ◆ What does this mean for the industry in terms of actions?
- ◆ Does the industry's strategy reflect these issues?
- ◆ What do stakeholders demand of companies and whole business sectors concerning sustainable development?
- ◆ Is it possible to transfer general sustainable development objectives to the aluminium industry?
- ◆ What are stakeholders' expectations?
- ◆ Where do governments, NGOs and other organizations (e.g. research institutes, universities, trade unions), actors representing consumer needs (e.g. consumer organizations) and business (individual enterprises and business associations) address sustainability targets and indicators relevant to the industry?
- ◆ What are priority issues for the industry?
- ◆ How can environmental, social and economic sustainability be measured?
- ◆ Which set of indicators can be transferred to aluminium and the aluminium industry? Or how can aluminium and the aluminium industry be described using a set of indicators?
- ◆ What are indicators' potential and limitations?
- ◆ Is it possible to give equal consideration to environmental, social and economic aspects while taking into account their interdependencies?

mation internal and external stakeholders expect from the aluminium industry.

Analysis of the survey results showed that so far there is greater consensus on environmental information and less consensus on social and economic information. This finding can be explained by the fact that environmental information and indicators have long (for over 20 years) been a subject of public discussion and scientific reviews. In contrast, economic and social information/indicators have played a less important role in stakeholder discussions until recently. This situation is changing in the current debate. The situation has also been described in the Global Reporting Initiative reporting guidelines, as shown in **Figure 4**.

Whereas the agenda review and the focus area analysis serve to identify a wide range of possibly relevant sustainability issues, consideration of stakeholder expectations is used to establish priorities and a list of relevant categories and aspects for the sector's path to sustainability. This list has the character of an initial sketch of opinions; it can be used as a starting point for further integration of information-sharing and improved understanding among stakeholders.

Figure 2
Concept specification: splitting the sustainable development concept into dimensions, categories and aspects



Source: adapted from Kohler, 1987

Table 2
Categories and aspects to be examined in sustainability reporting

Categories	Broad areas or groupings of economic, environmental or social issues of concern to stakeholders (e.g. air, energy, labour practices, local economic impacts)
Aspects	General types of information relevant to specific categories (e.g. GHG emissions, energy consumed according to source, child labour practices, donations to host communities); a given category may have several aspects

Source: GRI (see www.globalreporting.org)

Selecting sectoral sustainability indicators

One of the main challenges involved in selecting sustainability indicators for business is the variety of different business characteristics. It is tempting to assume that one "universal" set of indicators could apply to all sectors, but in practice decision-making groups must distinguish between core and specific sustainability indicators.

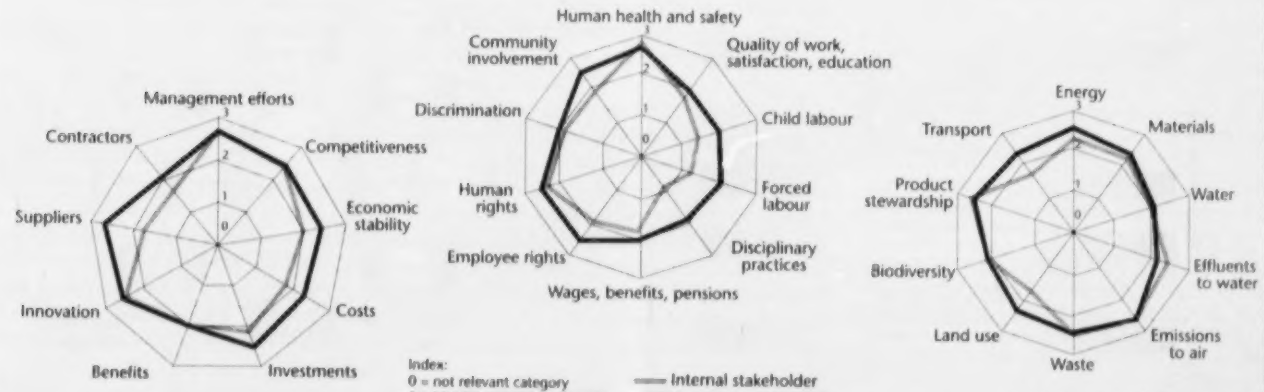
Core indicators are generally internationally agreed. They relate to a global sustainability concerns or values and are relevant and meaningful to virtually all businesses. These indicators provide data that can be aggregated from micro- to meso- or macro-level. *Specific indicators* depend on the business's specific nature. Such indicators provide information at micro- or meso-level; aggregation to macro-level is often not possible.

Due to the indicators' context-related nature, core elements of the indicator selection process can be derived from the context in which sustainability indicators obtain their relevance. This context is referred to as the "framework of sustainability indicators" (Kuhndt, Geibler and Eckermann, 2002). It has two components: content-related and use-related. As shown in **Figure 5**, each component consists of several elements.

The *content-related component* of the framework describes current – rather traditional economic – targets and goals formulated by the sector (e.g. by its associations) along with the sector's sustainability vision if such a vision currently exists. Categories and aspects derived using the approaches described in the previous section are also listed. The *use-related component* provides information concerning application of the indicators (purpose of use, user, area of application) as well as the scope of the object inspected, including a definition of its system boundaries.

Indicator selection finally takes place based on content- and use-related information. To facilitate this step, indicator selection criteria should be defined. Such criteria help evaluate indicators and ensure the selection of adequate indicators. For example, selection criteria could include reliability, validity, relevance, comprehensibility, data availability, and reasonable cost. Besides these generally used and accepted criteria, it is useful (according to the indicator development approach) for any decision-making process to consider the relevance of underlying aspects of the stakeholders' viewpoint as related to the survey; this is in addition to the relevance of the agenda review, the internal rele-

Figure 3
Survey results related to the question: what type of information do internal and external stakeholders expect from the aluminium industry?



Source: Kuhndt, Geibler and Eckermann, 2002 vance for the sector involved, and the possible level of aggregation (e.g. on the process, product, site, company or sector level).

The selection criteria applied and the selection of indicators have been discussed in a dialogue process involving potential users of the indicator set in the aluminium industry. Indicators have been designed for the categories and aspects listed in **Table 4**.

It is necessary that the indicator set designed be interpreted in its entirety. All categories, aspects and indicators should be examined when the indicator system is used. For non-selected categories, aspects and indicators, an explanation should be given (e.g. data are currently not available, or the cost of data collection for the indicator is too high). With respect to the data availability and novelty of some indicators, it is reasonable to establish a specific timeframe (priority) within which an indicator should be available. To portray the complexity of sustainable development, it is crucial to consider interlinkages within the indicator system. The interlinkages have therefore been highlighted in the indicator set and need to be reflected when the indicator system is used. For example, human rights issues need to be included in the following categories: corporate social performance; stakeholder dialogue on environmental, economic and social performance, and communication; social cost accounting; external effects; suppliers/contractors; and life-cycle aspects.

The indicator set designed is of a temporary nature. It needs to be revised from time to time to adapt the indicators to changing stakeholder demands, significant modifications in the underlying sector (e.g. technological innovation), and progress made in research on sustainability indicators. Revision on a regular basis is a common management practice aimed at continuous improvement.

Table 3
Perceptions of the most important aspects of aluminium's life cycle phases (number of survey participants, n=23)

Life cycle phase	Aspects perceived as most important
Bauxite mining	• land use after mining • image of company/public image • protection of ecosystem • dialogue with community
Alumina production	• image • community involvement • kind of energy carrier consumed • amount of thermal energy consumed
Primary smelting	• CF4, C2F6 emissions • efficient electricity production • CO_2 emissions • amount of electricity consumed
Aluminium processing and manufacturing	• product development • design for recycling • technological development • amount of energy consumed
Use phase	• reduced fuel consumption in transport applications • reduced emissions due to light weight in transport applications • end-of-life value products • recycling systems
Recycling	• improvement of recycling • improvement of collection system • emissions • reduced cost through design for recycling
Transport	• competitiveness • accident prevention • reliability • employee training in risk prevention

Source: Kuhndt, Geibler and Liedtke, 2002

Conclusions

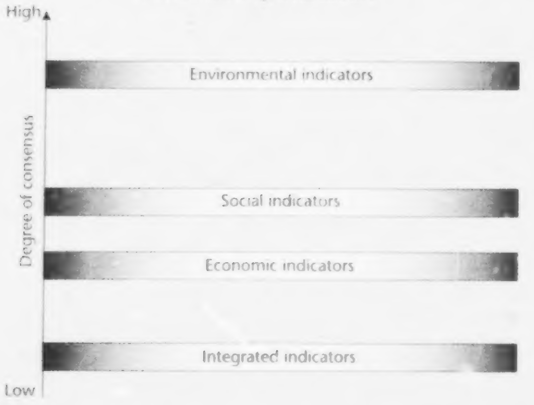
The experiences gained through developing a set of sectoral sustainability indicators for the European aluminium industry have demonstrated that the approach presented here addresses the major characteristics of sustainable development (Kuhndt, Geibler and Eckermann, 2002), as shown in **Figure 6**.

The stakeholder approach considers the specific *context* of the organization in focus. Thus, the involvement of stakeholders is an important element when a sustainability indicator set is developed. Once stakeholders are involved effectively, the development of an indicator set is more transparent and the stakeholders build up trust for a long-term relationship. In this way stakeholder involvement follows the trend of recent initiatives promoting sustainable development (e.g. the UN Global Compact initiative, the Global Reporting Initiative, the UK Roundtable on Sustainable Development, and the German Council for Sustainable Development) which have drawn on the stakeholder approach as a way to create a broad consensus among different societal groups

For the actors involved in developing indicators, it is crucial to derive a more tangible view of the *conceptual character* of sustainable development. This can be achieved through reviewing and understanding the current sustainability debate, identifying relevant focus areas, and considering stakeholder expectations. Instead of integrated indicators being developed directly for sustainability, they are developed for identified aspects that are considered to be relevant. One of the main challenges with respect to achieving sustainable development is the interrelation between numerous categories and aspects. This *complex diversity* can, as a first step, be addressed through developing a set of indicators. Within this set, interlinkages between different aspects can be highlighted. The interlinkages should be considered when using the set.

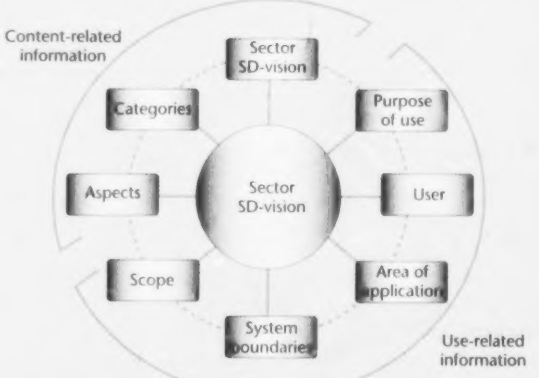
Sustainable development relates to an unlimited time horizon and is an on-going dynamic process. The *dynamic character* of sustainability has been considered in the development of the indicator set when considering two issues. First, the COMPASS methodology outlines a dynamic discussion process through a sequence of workshops. Second, the flexible timeframe, as suggest-

Figure 4
Degree of international consensus on sustainability indicators



Source: GRI, 2000 (see www.globalreporting.org)

Figure 5
Framework of sustainability indicators



Source: Kuhndt, Geibler and Eckermann, 2002

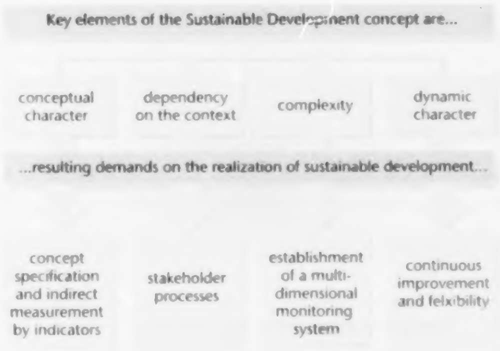
Table 4
List of sustainability categories and related aspects

1.	Management efforts
1.1	Sustainability policy and strategy
1.2	Corporate economic performance
1.3	Corporate social performance
1.4	Corporate environmental performance
1.5	Stakeholder dialogue on environmental, economic and social performance
1.6	Communication
2.	Costs
2.1	Environmental cost accounting
2.2	Social cost accounting
2.3	External effects
3.	Investments and innovation
3.1	Investments in R&D
3.2	R&D to improve sustainability performance, best available technology (BAT)
3.3	Cooperation with science (external)
4.	Economic stability
4.1	Financial performance
4.2	Risk management
5.	Competitiveness
5.1	Long-term profit
5.2	International competitiveness
6.	Human health and safety (H&S)
6.1	Corporate H&S programmes
6.2	Corporate H&S performance
7.	Wages, benefits, pensions
7.1	Level of wages
7.2	Benefits provided to employees
8.	Quality of work, satisfaction, education
8.1	Quality of management
8.2	Types of work organization (e.g. teamwork, job rotation)
8.3	Worker participation in decision-making
8.4	Education, qualification, training
9.	Discrimination
10.	Human rights
11.	Employee rights
12.	Forced labour
13.	Child labour
14.	Community involvement
14.1	Efforts to understand community concerns
14.2	Corporate role in community/region/country
15.	Energy
15.1	Amount of energy consumed
15.2	Energy generation
16.	Water
16.1	Water use
16.2	Effluents to water
16.3	Types of effluents
17.	Air emissions
17.1	Emission types and amounts
18.	Waste
18.1	Amount of waste generated
19.	Material use
20.	Land use
21.	Raw material availability
22.	Suppliers/contractors
23.	Product stewardship
23.1	Customers
23.2	Use phase aspects
23.3	After-use phase aspects
23.4	Life cycle aspect
24.	Transport

ed for implementation of the indicator set, makes adaptations possible for a specific organizational context. Over time, single aspects might be added if stakeholders demand information on additional issues. Experience with environmental reporting shows that more aspects tend to be added than are dropped.

As highlighted above, developing an indicator set for a sector depends on the context. Here, the regional context might be very influential. The importance of some aspects (e.g. drinking water consumption or employment) is likely to vary among geographical regions. Regional differences might be taken into account by considering specific national or regional agendas and/or stakeholders. However, once the set of sustainability indicators has been established, it is suggested that they be integrated into the management accounting system. Next, information that might be presented in a sectoral sustainability report could be collected: this can be seen as an important tool in a continuous improvement process supporting progress towards more sustainable development (Kuhndt, Geibler and Liedtke, 2002).

Figure 6
Key elements of the sustainable development concept and resulting demands on its realization


Key elements of the Sustainable Development concept are...
conceptual character
dependency on the context
complexity
dynamic character
...resulting demands on the realization of sustainable development...
concept specification and indirect measurement by indicators
stakeholder processes
establishment of a multi-dimensional monitoring system
continuous improvement and felxibility

Source: Kuhndt, Geibler and Eckermann, 2002

To harmonize measurement of this indicator set, data sheets that consider international and national measurement approaches have to be developed as the next step. The information collected could then be presented in a sectoral aluminium sustainability report. As emphasized above, the indicator set developed depends on the specific context (the aluminium industry project has been based mainly on the views of European stakeholders) and has a dynamic character. Moreover, to express the continuous character of the stakeholders, further consultations are necessary. This approach allows participating stakeholders to see the effects of their input and the authenticity of stakeholder consultations by the aluminium industry.

Furthermore, to support continuous use and development of the indicator set, a management structure and an interdisciplinary sustainability team supporting decision-making aimed at the promotion of sustainability might be set up at the sectoral and company level. Such a structure and team could also help develop sector-wide sustainability visions and targets. With these visions and targets, the sustainability indicator set can be built into a long-term framework.

Acknowledgements

For specific questions concerning the aluminium industry and discussions of sustainability issues, this project was accompanied by an expert group consisting of Hydro (chair), the German Aluminium Association (GDA) (coordination), Alcan, and the European Aluminium Association (EAA). The project was conducted within the framework of the "Aluminium for Future Generations" activities. André Eckermann, Justus von Geibler, Michael Kuhndt and Christa Liedtke were members of the project team at the Wuppertal Institute.

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Facilitating uptake of cleaner production with decision support tools, learning opportunities and information technologies

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Summary
This article provides an overview of decision support tools that can facilitate uptake of cleaner production systems at the national to enterprise level. It addresses the challenge of how to reach and equip individuals participating in cleaner production education and outreach programmes, while providing relevant content and learning opportunities that reflect each person's capacity, capabilities and context. Electronic learning systems can vastly enhance access to existing information.

Résumé
Cet article fait le point sur les outils d'aide à la décision pouvant faciliter la pénétration des systèmes de production plus propre à tous les niveaux, des organisations nationales à l'entreprise. Il traite de la question suivante : comment atteindre et préparer les personnes participant aux programmes d'éducation et de vulgarisation sur la production plus propre et offrir un contenu et des possibilités d'apprentissage adaptés aux aptitudes, aux moyens et au contexte de chaque individu. Les systèmes d'enseignement électroniques peuvent améliorer considérablement l'accès aux informations existantes.

Resumen
Este articulo presenta una serie de herramientas de gestión y toma de decisiones que facilitan la incorporación de sistemas de producción más limpia a distintos niveles, de gubernamentales a empresariales. Se refiere al desafío de identificar y equipar a participantes en programas de educación y difusión de producción más limpia y aportar los contenidos relevantes brindando oportunidades de aprendizaje que permitan ampliar las capacidades y habilidades personales según el contexto individual. Los sistemas de enseñanza electrónicos amplían significativamente el acceso a la información existente.

The first generation of environmental technologies typically involved additions to existing production systems that treated waste. Generally the pollution burden was transferred from one location or medium to another, incurring additional treatment costs and doing nothing overall to reduce waste generation or raw material and energy consumption.

The second generation of environmental technologies consisted of cleaner production systems which emphasize pollution prevention through reduced consumption of raw materials and energy and no or reduced waste generation, thereby increasing productivity and bringing environmental, financial and other benefits to the enterprise and the community.

In the third (current) generation of technologies and systems environmental performance considerations are fully integrated with economic and other operational issues and the system as a whole is sustainable. Sustainable production and consumption requires planning, design and management practices that facilitate innovative approaches to the reuse, remanufacturing and recycling of the limited amounts of "waste" that cannot be avoided.

Decision support tools for site- and application-specific technology assessments

Technology assessment is a broad concept that refers to the process of endeavouring to understand the likely impacts of the use of new or upgraded processes and technologies by an industry, municipality, country or society.

Environmentally focused technology assessment (EnTA)

EnTA minimizes the need for detailed technical data and facilitates multi-stakeholder dialogues, leading to consensus decision-making related to selecting a technology that will be the most environmentally sound, socially acceptable and economically viable. EnTA thus overcomes many of the acknowledged shortcomings of environmental impact assessment (EIA). Through early recognition of key issues, possible alternatives, potential solutions and areas of consensus, EnTA allows further effort to focus on points of major conflict and dispute.

EnTA focuses on characterizing the potential impacts associated with the outcome categories.

The outcome categories are:
- human health impacts;
- local natural environment impacts;
- social and cultural impacts;
- global impacts;
- resource sustainability; and
- economic viability.

The performance of each technology option is evaluated using these broad categories.

Strategic environmental assessment (SEA)

SEA is a tool designed to ensure that the environmental consequences of policies, plans, programmes or proposals are considered early in the decision-making process and are addressed along with economic and social considerations.

Since cleaner production is a critical element of environmentally sound design, the use of SEA at the policy, planning and initial design stage will help ensure identification of processes that minimize environmental degradation and contribute to sustainability.

Life-cycle assessment (LCA)

As a decision support tool for environmental management, LCA involves the evaluation of the environmental aspects of a product system through all stages of its life cycle. A product's life cycle embraces all of the activities that go into making, transporting, using and disposing of that product.

LCA can be used to give greater depth and rigour to the guidance coming from an EnTA through a more formalized analysis of the technology investment over its entire life cycle. Both tools complement the SEA, thereby ensuring that decisions made at the pre-investment stage of the technology intervention will help ensure identification of technology options that minimize environmental degradation and contribute to sustainability.

Environmental impact assessment (EIA)

EIA is a decision support tool designed to help ensure that development and investment proposals, activities, projects and programmes are environmentally sound and sustainable. It facilitates identification, analysis and evaluation of the significance of potential environmental impacts and the identification and elaboration of measures that will avoid, remedy or mitigate any adverse impacts. EIA allows informed decision-making as to whether a proposal should proceed and, if so, under what conditions. It also establishes a monitoring and environmental management regime for implementing mitigation measures, monitoring impacts for compliance and ascertaining if impacts are as predicted.

Above all else, an EIA should foster public discussion about project proposals and technologies. This is important for ensuring an open and balanced approach and for encouraging consideration of those environmental effects, costs and benefits which cannot always be identified or measured by scientific or technological means.

Environmental risk assessment (EnRA)

All decisions and actions have environmental consequences, many of which are unintended. Risk is the likelihood that a harmful consequence will occur as a result of an action. EnRA is the determination of the potential impact of a chemical or physical agent on ecosystems, habitats and other ecological resources and on human health and well-being.

Risk assessment provides a relatively objective way to rank the hazards associated with the options under consideration, in terms of both human health and ecological effects, and to decide which are acceptable or manageable in the local context.

Social impact assessment (SIA)

SIA can be used if there is a need for more comprehensive, in-depth and rigorous determination of the impacts a given policy, plan, programme, project, activity or action may have on the social aspects of the environment.

Cost-benefit analysis (CBA)

CBA is one way to organize, evaluate and present information about actions governments take to improve public well-being. The technique is intended to improve the quality of public policy decisions, using as a metric a monetary measure of the aggregate change in individual well-being resulting from a policy decision. Because of this need to place monetary values on attributes of human well-being for which no market prices exist, CBA is often complicated, expensive and somewhat controversial.

The advantages of CBA include:

- transparency and potential for engendering accountability;
- provision of a framework for consistent data collection and identification of gaps and uncertainty in knowledge; and
- with the use of a money metric, the ability to aggregate dissimilar effects (such as those on health, visibility and crops) into one measure of net benefits.

Criticisms of CBA include the assumptions that individual well-being can be characterized in terms of preference satisfaction, and that aggregate social well-being can be expressed as an aggregation of individual social welfare, as well as the empirical problems encountered in quantifying economic value and aggregating measures of individual welfare.

Environmental management system (EMS)

An EMS can help maintain environmentally sound operations. It ensures that environmental issues are managed consistently and systematically throughout an organization. An EMS can also assist an organization in comprehensively addressing environmental issues and obtaining greater credibility with regulatory agencies and clients. It sets out environmental policies, objectives and targets for an organization, with predetermined indicators that provide measurable goals and a means of determining if the performance level has been reached.

For organizations, an EMS is an excellent mechanism for promoting positive change, such as increased uptake and continuing effective implementation of cleaner production systems. Successful implementation of an EMS can lead to increased environmental awareness, continuous improvement, and the adoption and use of environmentally sound technologies.

New approaches to fostering learning

Environmental training and education equips individuals with the motivation, knowledge, skills and commitment to identify and implement commercial and life-style decisions and civic actions that favour ecologically sustainable and socially just ways for people to interact with nature and with each other, and to relate to future generations. Yet the fundamental challenge is how to reach and equip the large numbers of people seeking environmental training and education, while at the same time providing relevant content and learning opportunities for each individual. This dichotomy has been a long-term dilemma for environmental trainers and educators. The increasing globalization of environmental training and education has enhanced the schism between generic, global approaches on the one hand and, on the other, locally based approaches that reflect specific needs attuned to local culture, environment and socio-economic circumstances.

An example of a generic environmental training package is the *Urban Environmental Management: Environmental Management System Training Resource Kit*, a result of collaboration between UNEP, the International Council for Local Environmental Initiatives (ICLEI) and the International Federation of Consulting Engineers (FIDIC).

The kit consists of a modular "Train the Trainer" package which uses an EMS to provide the context for the tools that will integrate sustainable development into the various aspects and priorities of urban management. The kit is largely generic, designed to be suitable in all conditions and circumstances. Adaptation of the kit to various cultural and political situations is aided by its modular construction and by the use of case studies.

UNEP and the UNESCO have developed a professional development workshop manual, *Teaching for a Sustainable World*.[1] It provides training modules to facilitate pre-service and in-service teacher education on curricular themes and learning experiences that promote education for sustainability.

The increasing importance of global training approaches has been expedited by exponential growth in the availability of, and access to, information technologies. The growing dominance of content and delivery methods designed and marketed for a global audience contravenes the principle that environmental training and education must be needs-driven, relevant, and pedagogically sound. The changes threaten the quality, relevance, correctness and access of environmental education and training because they enlarge the gap between learning theory and practice, general knowledge and useful, local application, cultural indifference and sensitivity, and available and unattainable technologies. Moreover, global education and training are vulnerable to underestimating the socio-economic and cultural factors in the construction and receipt of education.

A myriad of other factors impact environmental practices, including the economic and political contexts. The efficacy of generic environmental education and training programmes may be fatally flawed if participants in different cultures engage with the learning material when they have fundamentally different world views, philosophies, and understandings of the term "environment" and of the culture and perspectives on the environment held by others. Thus knowledge of the various perspectives on the environment, and an understanding of the cultural basis for their similarities and differences, are a prerequisite to achieving good learning outcomes when dealing with environmental topics.

Building and enhancing the capacity to plan and manage the environment in ways that produce sustainable outcomes involves regional and international cooperation to share best practice guidelines and technologies. Even when there is agreement at an international level to cooperate and overcome environmental problems, the translation of ideas into action by different communities can be modified by their cultural identity and context.

Environmental training and education have a special role in informing attitudes, building knowledge and strengthening motivation, especially of young people. Moreover, in each country and culture there is likely to be a wealth of local environmental knowledge that can be used wisely to both prevent and solve local environmental problems. Traditional knowledge and practices can be supplemented by contemporary environmental assessments and solutions.

This can be achieved by following "good practice strategies" in teaching and learning that add value to the contemporary generic approaches, by acknowledging the importance of individual and collective values, aspirations and local capacity, capability and context, and by accommodating widely varying perspectives of and attitudes towards the environment. The following "good practice strategies" for the design and delivery of environmental education and training are proposed in order to optimize the learning outcomes of generic environmental training and education initiatives using modern information technologies.

Language

For a range of reasons including the high costs of production, English has become the *lingua franca* used for the hard-copy paper resources that support generic environmental education and training programmes. Yet learning in a second (or third or fourth) language can be a major obstacle to a participants' willingness to engage, persevere and gain from a learning experience, and incorrectly assumes that all English terms can be translated into the native tongue of all potential users.

Culturally appropriate pedagogy

Interactive teaching/learning strategies with on-line discussions and "bulletin boards" can offer participants the capacity to schedule their learning so that it "fits in" with family organization, gender roles, local cultural obligations and social values. Similar outcomes can be achieved in conventional delivery using group work to evaluate alternative models/approaches; undertake SWOT (Strengths, Weaknesses, Opportunities and Threats) analyses; generate local action plans, etc. that enable participants to draw on their own experiences, and relate their learning to their own cultural, social and economic contexts.

Different social, cultural and religious values mediate the importance participants and communities attach to particular environmental issues. The global relevance of generic environmental education programmes and training has to be explicitly connected with local issues and action. Information technologies can help generate databases of hypothetical and real-life case studies around specific local environmental problems that also have potential relevance to other locales where different constraints, opportunities and capacities give rise to possibilities for different solutions.

Evaluation

Evaluation provides an important opportunity to assess the effectiveness of adapting and applying global packages in a local context. However, existing instruments and evaluation practices often lack meaningful substance to inform and improve future delivery and better meet the needs of participants.

Yet the general field of programme evaluation offers a rich spectrum of formative and summative evaluation approaches, ranging from simple auditing of learning outcomes to extensive naturalistic enquiry conducted *in situ*. Environmental education and training programmes would benefit from using more structured, multi-method approaches to evaluation, drawing on the expertise of professional evaluators to gather meaningful feedback about the cultural appropriateness of the training programme and its relationship to participants' learning and programme objectives.

As an example, local level capability in EnTA is being promoted through an integrated approach based around the use of a generic computer-based learning package (EnTA OnLine) and conventional training at national or sub-national level.

In terms of local delivery of training, group simulation exercises involving role-playing are used. They provide an opportunity for participants to "learn by doing" and to share relevant knowledge and expertise that they have already accumulated in their own work environments.

E-learning

The growing recognition in recent years of the importance of learning, particularly lifelong learning, for the envisioned knowledge-based economies of the present century has made headway for on-line distance education such as web-based training and other forms of e-learning. To date, most initiatives have not included adequate provision of the guidance that is required to design such learning environments. Concerns exist that many learning materials currently available electronically are not purpose designed.

A process of analysis and application is required, to ensure that e-learning environments include quality teaching and learning approaches and materials that will engage the user in meaningful teaching and learning activities.

Good practice guidelines for e-learning

To date, there has been relatively little experience of delivering learning materials electronically and there are no commonly accepted e-learning design standards. The use of e-learning tools in the development, deployment and delivery of outreach and professional development programmes facilitates the operation of an approach that is flexible, dynamic, and adaptable to include relevant content. The approach should also be iterative and personalized, in order to assist in improvements, and networked and integrated into a total e-learning solution.

Key elements of the product development and deployment cycle

Key elements of this cycle are:

- a coherent and integrated approach, aided by content development and operational protocols;
- continuous quality improvement: assessments will be used to identify areas for further development;
- adoption of and adherence to good practice guidelines for e-learning: e-learning enhances access to existing information and development of new e-learning tools and products in accordance with good practice guidelines;
- design of computer-based outreach and professional development packages covering a series of decision support tools: state of the art packages (e.g. EnTA, EMS, EnRA, CBA) prepared cooperatively by product development partners;
- testing of prototypes: to assess the extent to which the training has the potential to produce the desired outcomes in the performances of both the individual participants and the agencies to which they belong;
- adaptation of a generic package to meet the needs of specific user groups: e-learning content development and management tools provide a method for developing e-learning with relative ease, as the resulting environment is easy to maintain and update; the ease with which the e-learning environment can be altered supports course transfer, translation and adaptation for specific cultural and local contexts;
- maximum deployment of the packages, using the flexibility offered by information management technologies;
- promotion to ensure that target groups are fully aware of the opportunities for professional development.

Key elements of the cycle for delivery of the outreach and professional development services

Key elements of this cycle are:

- a coherent and integrated approach, aided by learner management tools, knowledge sharing tools and operational protocols;
- continuous quality improvement: assessments will identify areas for further development;
- adherence to good practice guidelines for e-learning: both hypothetical and real-life case studies and on-line discussion groups are applicable to the specific context of the learner;
- establishment of centres of competency to provide technical, pedagogic and other support: the e-learning initiatives need to be supported by conventional learning approaches, e.g. small-group activities (discussions/activities, evaluating alternative models/approaches; SWOT analyses; generating local action plans, etc.) that enable participants to draw on their own and others' experiences and relate learning to their own cultural, social and economic contexts;
- evaluation of operational packages and learning outcomes, to assess the performances of both the individual participants and their agencies.

Key elements of the software architecture

The components of the e-learning toolbox are content collaboration and management tools, learner management tools and communication, collaboration and knowledge sharing tools. These tools can stand alone or are offered as part of an integrated suite or learning platform, e.g. Aspen.

Content development and management tools

Content development tools are those tools used to develop content of all kinds (i.e. informational, presentational and instructional) in any format (e.g. text, graphics, animation and video).

A learning content management system (LCMS) creates, stores and retrieves reusable content. Content is typically maintained in a centralized content repository in the form of small self-describing, uniquely identifiable objects or learning objects, each of which satisfies one or more well-defined learning objective. An advanced LCMS has the ability to track the user's interactions with each learning object and use this detailed information to deliver highly personalized learning experiences while providing authors with rich reports for analyzing clarity, relevance and effectiveness of content so it can be improved on an ongoing basis.

Learner management tools

Learning management systems (LMS) can help manage an organization's learning activities and competencies. From an end-user point of view, an LMS provides an effective way to keep track of individual skills and competencies, and to provide a means of easily locating and registering for relevant learning activities to further improve the learner's skill levels. Administratively, an LMS makes it easy to track, manage and report on learning activities and competencies. An LMS primarily focuses on competencies, learning activities and the logistics of delivering learning activities.

Communication, collaboration and knowledge sharing tools

These tools include both asynchronous (e.g. discussion board) and synchronous (e.g. chat and instant messaging) tools, meeting and conferencing tools, and collaborative learning and knowledge sharing tools. Given that learning is inherently a social, dialogical process, technologies that support this conversational process by connecting learners are essential components of outreach and professional development services.

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What next in cleaner production technologies?

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Summary

Focusing on the technical aspects of cleaner production technologies can promote efficiencies, functional optimization and waste avoidance in industries and governments. In view of current challenges related to the achievement of sustainable production and consumption systems, broader social and work quality values must be integrated in the present day cleaner production concept. To make sustainability possible, challenges such as the integration of cleaner production and life-cycle approaches in emerging production technologies need to be addressed, along with occupational safety, environmental and social responsibility concerns.

Résumé

Mettre en évidence les aspects techniques des technologies de production plus propre peut contribuer à promouvoir auprès des industriels et des pouvoirs publics diverses formes d'efficacité, l'optimisation fonctionnelle et la réduction des déchets. Compte tenu du défi que constitue la mise en place de systèmes durables de production et de consommation, il est indispensable d'intégrer des valeurs plus larges de responsabilité sociale et de qualité du travail dans le concept actuel de production plus propre. Pour que le développement durable soit possible, il faut relever des défis comme l'intégration dans les technologies de production émergentes de démarches basées sur la production plus propre et le cycle de vie, et prendre en compte les questions de sécurité au travail, de responsabilité environnementale et sociale.

Resumen

El desarrollo tecnológico de procesos de producción más limpia puede resultar en mayor eficiencia, optimización operativa y disminución de residuos tanto en sectores industriales y gubernamentales. En virtud de los desafíos actuales relacionados con el logro de sistemas de producción y consumo sustentables, el concepto actual de producción más limpia debe integrar valores sociales y de calidad del trabajo. A fin de alcanzar la sustentabilidad, las tecnologías de producción emergentes deben promover la integración de propuestas de producción más limpia y procesos de ciclo de vida con cuestiones de seguridad ocupacional, ambientales y de responsabilidad social.

Cleaner production has long been aligned with the development of new technologies. In rejecting the earlier tradition of end-of-pipe, pollution control, and waste treatment technologies, cleaner production opened up opportunities for innovation and application of new production technologies. These cleaner production technologies were to be adjuncts of the broader search for management strategies that would result in less waste, less water and energy consumption, and less use of toxic and hazardous chemicals.

Some of the early national and regional programmes organized special initiatives to promote so-called "clean technologies", and some in the national cleaner production programmes came to see that the development and commercialization of clean (low- and no-waste) technologies could advance national economic development as well as environmental quality objectives. Although some considered "clean-up" technologies within this concept, most settled for a narrower definition focused on the technologies of production, assembly and product management. Thus the concept of clean or cleaner technologies became embedded in the idea of cleaner production. Even where these cleaner production programmes promoted clean production technologies, early proponents remained sceptical that too heavy an emphasis on technologies might lead to a kind of technology obsession. They feared that too much attention to technology would undervalue the importance of changing production techniques, practices and values in business management and would neglect what was often referred to as "changing attitudes and improving know-how".

Today we have a more balanced view. A central focus on the technical aspects of cleaner production technologies can promote efficiencies, functional optimization and waste avoidance in industries and government facilities, but it is often the management and use of production technologies that is a central objective in striving towards environmentally superior performance. Today, we recognize that cleaner production is much more than changing the materials and equipment of production. However, as we think about the current challenges of achieving sustainable systems of production and consumption, it is clear that we have not yet integrated broader social and work quality values into our conception of cleaner production.

Drivers and developers of cleaner production technology

Cleaner production solutions often involve a combination of new behaviours and new technologies.

Table 1
Conventional cleaner production technologies

Waste reduction technologies	This involves various operation improvement technologies that reduce the likelihood of spills, leaks, accidents, contamination and unwanted volatilization. These technologies range from simple devices such as lids and covers to more complex couplings, connectors and valves and to sophisticated single-vat batch processing equipment.
Energy efficiency technologies	This includes energy-efficient pumps, fans and blowers, reduced friction surfaces, energy-conserving conveyors and materials transport vehicles, and energy-efficient heating and cooling systems.
Processing efficiency technologies	These technologies involve various physical, electrical or chemical sensors and process control devices that permit more effective monitoring and process management.
Cleaner material technologies	Chemical substitutions may include simple "drop-in" replacements or more complex toxic substance replacements that involve alternative catalysts and reagents, as well as conversions from liquid to solid material processing and solvent-based to water-based cleaning or processing.
Recycling and loop-closing process technologies	This often involves various separation technologies that permit materials to be cleaned or treated so as to permit recycling and reuse. This includes distillation, filtration and extraction technologies.
Cleaner products	Longer life, adaptable, materials- and energy-conserving, easily recycled, and non-hazardous products reduce waste and environmental burdens throughout a product's life cycle.
Cleaner product management technologies	Materials separation technologies enhance product recycling and returnable packaging, containers and shipping cartons permit product take-back and reuse or re-manufacturing.

The motivation for these initiatives often involves a combination of factors. A report from the Organisation for Economic Co-operation and Development (OECD) identified three factors which often act in parallel to promote the adoption of cleaner production programmes: market forces, advances in science and technology, and government policy. Government policies can be particularly important, in that strong environmental regulations typically play an important role particularly where enforcement is effective. The costs of appropriate waste management and the treatment of hazardous wastes are also a significant force, but only where regulatory enforcement prevents less protective waste management options. The same can be said for liability and the costs of environmental insurance. The opportunity to achieve process efficiencies that improve product yields and decrease wastes can be a significant incentive, as well as the opportunity to derive economic returns from recycling wastes. In addition, the desire to maintain a good public image or restore a tarnished image may be an important driver.[1]

Within this context, technical agents from government programmes or private consulting firms may promote retrofitting and adaptation of existing equipment or replacement of conventional technologies and materials with new technologies and materials. In other words, technologies are not drivers of cleaner production, but rather facilitators for those who for reasons of cost, regulation, liability, market advantage, or image wish to convert to cleaner forms of production.

Typically, these initiatives have resulted in the adoption of currently available technologies and, for the most part, the technology advances made in adopting cleaner production have been incremental and cautious. Yet the markets made possible by cleaner production initiatives have also offered opportunities for some technology innovation. Thus powder coatings, aqueous cleaning systems, fluxless soldering, counter-current rinsing, mechanical paint stripping and water-based inks have all been developed and promoted as cleaner alternatives to conventional process technologies. Some of these innovations have been developed by conventional production equipment or materials suppliers, but the majority have emerged from innovators in the production industries themselves or from undercapitalized entrepreneurs that have simply seen an opportunity in an otherwise unrecognized market.[2]

Conventional cleaner production technologies

In 1979 the Commission of the European Economic Community developed the concept of clean technology as "any technical measure...to reduce or even eliminate at source the production of any nuisance, pollution or waste, and to help save raw materials and other natural resources and energy."[3] In establishing this definition the Commission went on to identify three criteria for identifying clean technologies:

- less pollution discharged to the environment;
- less waste (low- and non-waste technology);
- less demand for natural resources (water, energy and raw materials).

These criteria still serve fairly well to characterize conventional cleaner production technologies. Over the past decade of work a wide array of cleaner production technologies have been identified.[4] Some have quite broad application across many production processes, while others are quite tailored and specific to unique processes. Conventionally, these technologies can be divided into several categories (**Table 1**).

Even a brief look at the past decade reveals that many of these technologies have been tried and have proven effective, but the pace of adoption has been slow and unsteady. Government pressures have been mixed and uneven. A few countries have offered robust and well-conceived policies of encouragement, but most countries' programmes have been underfunded, understaffed and fairly ad hoc. Wealthier countries have fared better, with state-of-the-art technologies appearing from several vendors, but poorer countries and those which are now industrializing have often had to do with second-hand production technologies that are being replaced in more industrialized areas. Indeed, social factors such as occupational hazards or working conditions have seldom received the same level of attention as environmental effects.

The industries that traditionally produced the pollution control and waste treatment technologies have not disappeared. Through heavy promotion of pollution control and waste treatment equipment (particularly waste incinerators), they tend to divert and weaken the potential market for cleaner production technologies. In the short term, the production, sales and servicing of pollution control and waste treatment equipment provides substantial economic returns to a wide range of private consultants and equipment manufacturers, particularly in major exporting countries such as Japan, Germany and the United States. With tightening economic conditions in the industrialized countries, these often short-term benefits are difficult to pass up for the more emergent markets in technologies for retooling and converting existing industrial processes to cleaner production.

New directions in technologies of production

The history of production is continuously affected by the ongoing development of science and technology. Technology innovation and enhancement are important factors in advancing cleaner production. Thus while it has been important to look first for simple, off-the-shelf technologies that are readily available for improving environmental performance, it is also useful to look for the new developments in technologies that may promote - or inhibit - cleaner production. Currently there are several rapidly developing areas of technology that offer opportunities for cleaner production (**Table 2**).[5]

Yet to recognize that these technologies offer opportunities to improve environmental performance is not to assume that this is necessary or even likely. These technologies are not being developed specifically to improve environmental performance, and because this is not a design objective they often offer new hazards. The new composites and light-weight polymers that reduce energy use raise concerns about occupational hazards during manufacturing. The final products may be quite difficult to recycle or dispose safely. Information technologies may increase the amount of work per unit of energy or materials consumed, but they could as easily make increasing amounts of work available and thus overwhelm their own savings. Indeed, office computers have raised new occupational concerns around job stress and repetitive motion. Biotechnologies that depend on genetic modification of organisms offer opportunities for inadvertent hazards where those organisms are released to the environment. It remains too early to judge the possible hazards associated with manipulating matter at the nano-scale.

One area that is developing with a specific focus on environmental performance is green chemistry (also called sustainable chemistry). This new perspective has emerged within the field of conventional chemistry and is defined as "...the utilization of a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture and application of chemical products."[6] Green chemistry has demonstrated a broad range of new directions for chemical synthesis, catalysis, reactions and degradation. In the United States this new thinking about chemistry has been promoted by a well-regarded Presidential awards programme while in Europe the field has already developed its own journal and academic research centres. Because this approach directly addresses the chemistry of materials and production processes, it offers significant opportunities to advance cleaner production at a rather fundamental level.

Table 2
Developing technologies providing cleaner production opportunities

Sustainable energy technologies	New technologies provide opportunities for processing at ambient temperatures and pressures, reducing the need for heating and cooling, and increasing the options for renewable and self-generating energy sources. Photovoltaic and wind energies are developing rapidly; so are fuel cells and hydrogen-based sources.
Chemical processing technologies	Innovations in chemical synthesis and processing technologies involve new (non-metallic) catalysts and reagents, processing in supercritical fluids, new means of enhancing selectivity and new "zero-waste" processes that close water and materials cycles so as to reduce or eliminate wastes and material inputs.
Information technologies	Advanced information technologies provide new opportunities for monitoring, measuring, managing data, and communicating information that can improve processing technologies performance. New information technologies also offer new directions for reducing product consumption and increasing service substitution and servicing.
Biotechnologies	The life sciences offer many new opportunities for the use of renewable materials and for bio-processing and biodegradation. Enzyme-catalyzed reactions and harvesting materials from microbial processes offer new routes to chemical synthesis, particularly in the production of acids, bases and polymers.
Nanotechnologies	Recent advances in nano-scale technologies offer opportunities for more selective, finer scale, and more tailored production, with the potential for low and no waste processes.

Challenges for cleaner production technologies

Cleaner production has been formally promoted as one of the important strategies for achieving a more sustainable economy. Since the United Nations Conference on Environment and Development ten years ago, the UN has promoted the idea of cleaner production as a step towards sustainable production and consumption. But sustainable forms of production and consumption are driven as much by social values as by economic and environmental objectives. This broader set of values has not been well-integrated into cleaner production promotion and efforts need to be made to better inform future thinking about cleaner production technologies.

Thinking about the social as well as the environmental aspects of production raises many unaddressed questions. One immediate question involves the world-wide distribution of cleaner production technologies. Have the benefits of government environmental protection programmes resulted in a fair distribution of pollution prevention, waste reduction practices, and cleaner production technologies regionally or world-wide? Indeed, can those who promote cleaner production programmes address the social conditions of work as enthusiastically as they have embraced the environmental results? In terms of the technologies themselves this raises new opportunities to consider environmental and public health hazards from a life-cycle perspective and from the point of view of those who work near and with cleaner production technologies.

Future developments with cleaner production will continue to encourage innovation and development of new technologies. However, if these developments are to significantly enhance sustainable forms of production and consumption, these developments present a series of social challenges. There are at least five such challenges that need to be addressed to assure that cleaner production technologies meet the expectations of those who promote a sustainable form of development.

First, the cleaner production perspective must be better integrated into the emerging technologies of the future. In the above section some of those opportunities are identified. However, if these technologies are permitted to develop in their current form, there is no guiding principle that can assure that they will lead to cleaner and safer forms of production. Those who advocate cleaner production could simply wait and select those technologies that are appropriate as they emerge or they could take a more pro-active approach. This could mean that cleaner production programmes should work directly with chemical and technology suppliers to encourage the development and commercialization of cleaner technologies.

Second, the technologies of clean production must be considered from a life-cycle perspective. Production equipment is a product of a production process and, thus, needs to be subject to a full analysis over their life cycle. Energy efficient heaters and pumps and re-circulating water systems are assembled from processed materials, distributed to customers, used on site, and eventually disposed as they wear out or are replaced by higher performing equipment. The same type of analyses that are used to assess the life cycle of production materials and processes should be used to assess the life-cycle aspects of cleaner production technologies themselves.

Third, special attention needs to be paid to the recycling of production equipment. If new cleaner technologies result in the replacement of existing equipment, it is important to consider where and how that equipment is recycled or disposed. Among countries in the industrializing world there is a ready market for used production equipment even when, and especially where, such equipment is priced low because it is not state-of-the-art and it may no longer be permitted in industrialized countries. This down-cycling may originate from good intentions to improve the environmental performance in industrialized countries, but, if this adds new or continues existing hazards in production within industrializing countries, this needs to be addressed in considering cleaner production policies world-wide.

Fourth, cleaner production technologies must be occupationally safe as well as environmentally sound. Recent studies have shown that cleaner production programmes that are not sensitive to workplace issues can result in the adoption of technologies that increase hazards for workers. Recent events have also raised that importance of chemical process safety and security. Cleaner production technologies should be designed to promote the principles of inherent safety in order to prevent accidents or intentional abuse at production facilities.

Fifth, cleaner production technologies must respect the lives of those who work with them. The technologies should be human-centred and offer opportunities for flexibility and tailoring, skill development and human creativity. Closer attention to the organization of work and so-called "human factors" has been shown to offer physical, psychological and social benefits to those who use technologies. This can result in lower work stress and a higher sense of worker self-worth, a more positive attitude, and a more engaged workforce.

Cleaner production remains a major strategy for achieving improvements in the environmental performance of industries and governments. Cleaner production technologies are often central to implementing cleaner production programmes, but if these technologies are to advance the vision of a more sustainable economy, the range of underlying values and design goals must be expanded and deepened.

Notes

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5. A quick overview of these new directions and their potential limitations can be found in John Jaworski and David Minns, Technology Innovations and Cleaner Production: Possibilities and Limitations. *Industry and Environment* 24/1-2, January-June 2001, pp. 60-64.
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Eco-efficiency and beyond: the next sources of innovation

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Summary
To make development sustainable, we need to design an economy that works for all and forever within the limitations of the planet. The most important contribution business can make to this common undertaking is innovation – not innovation for the sake of novelty alone, or innovation only in the business sphere. Innovations in technology, consumer behaviour, social relations and policy frameworks must be combined if we are to succeed.

Résumé
Pour que le développement soit durable, il faut instaurer une économie qui fonctionne pour le bien de tous et pour toujours, dans les limites imposées par la planète. La principale contribution que le milieu des affaires peut apporter à cette œuvre commune est l'innovation, mais pas l'innovation pour le seul attrait de la nouveauté, ni l'innovation limitée à la sphère de l'entreprise. Pour réussir, il faut combiner les innovations dans plusieurs domaines : technologie, comportement du consommateur, relations sociales et politiques générales.

Resumen
Para impulsar el desarrollo sustentable, es necesario diseñar un sistema económico perdurable a favor de todos conforme a las limitaciones del planeta. La principal contribución del mundo empresarial en dirección a este objetivo común es la innovación – no la innovación por la novedad en sí misma, o innovación restringida al ámbito empresarial. Para alcanzar el desarrollo sustentable es importante promover la integración de innovación tecnológica, comportamiento del consumidor, relaciones sociales e implementación de políticas ambientales.

"Hooked on growth…" We've heard the message for the past 15 years. Yet on the whole it seems we've moved in the wrong direction. We continue to have a pattern of development that uses more natural resources and creates more waste than it should – now and in the long run.

According to the most simplistic description, our economy is a process that, on the supply side, uses natural resources to produce infrastructures, consumer goods and wastes. On the demand side consumers use these goods, accumulating or disposing them. They also need energy and water and natural space on that side of the process. This physical process is concurrent with a financial process worth about $29 trillion in added value (1998 World GNP): producers stretch the natural inputs to create value that is used for reinvestment in more productive capacity, for payment of taxes levied by the state, and for distribution to consumers, whether they are shareholders or employees.

This process is hooked on growth for three main reasons:

- The world population continues to increase.
- The need for financial security also increases as we continue to live longer, with a larger proportion of our time in education or retirement relative to our time in earning a living and saving.
- Our aspirations to a better quality of life and our dreams of who we would like to be are mainly expressed through the rituals of shopping, giving, and collecting material goods.

Tomorrow's markets

Some key statistics will help assess the direction taken by this process. The World Business Council for Sustainable Development, the World Resources Institute and UNEP selected 19 key trends that will shape the global business environment.[1]

Here is a sample:

- In the last ten years the average annual population growth rate was 1.6%. The Earth's population reached 6 billion in 2000 and is projected to be 7.9 billion by 2025 and 9.3 billion by 2050, a nearly stable state thanks to declining fertility rates. 98% of the projected growth will be in countries defined today as developing countries.
- World average life expectancy increased from 47 years in 1950 to 66 years in 2000 and will near 70 years in 2010.
- Rich countries whose population is already nearly stable will have a bulge of people aged 50-90 in 2020. The working age population in developing countries will reach 5.2 billion in 2020.
- 78% of the world population lives below the poverty threshold and the richest 1% receives as much income as the entire bottom 57%.
- World economic output has averaged 2.9% per year since 1975. At this rate it more than doubles every 25 years.
- World energy production rose by 42% from 1980 to 2000, an average 2% per year, demonstrating a small efficiency gain relative to economic output. At this rate it would only double in 35 years.
- Water consumption is estimated to increase twice as fast as population growth. 2.3 billion people are exposed to water stress affecting sanitation, agriculture and freshwater fishing.
- In the last decade the world lost 2% of its forested area.
- Estimates of the total material throughput of various economies indicate efficiency gains in North America and Europe, while most other economies become more material intense to satisfy the needs of a growing population.

What do those broad indicators tell us about the health and future of the system?

Getting better? getting worse?

Many things are indeed "getting better", to paraphrase the title of a chapter in *The Skeptical Environmentalist*.[2] The author is a statistician who takes issue with doom and gloom predictions of environmentalists and, in particular, his *bête noire* the Worldwatch Institute. We live healthier and longer, wealth is up, energy and material efficiency are up, with their effect on air quality improvement and waste reduction.

But this is the world seen from the perspective of the richest OECD countries. If "things are getting better" they are not even getting good enough by a long stretch. In absolute terms most environmental impacts continue to grow.

In the rest of the world, and for the large majority of its population, things are hardly getting better. Consumption and demographics increase the pressure on water and forestry resources, yet many are left below the poverty and hunger line.

While "getting better" can be statistically verified, "good or not good enough" are harder to establish. With all the attention it gets, it is still difficult to agree on the real state of the planet and the risks of running our economy at the current material and energy intensity. According to the World Wide Fund for Nature's *Living Planet Report 2000*,[3] we already crossed the threshold of available biocapacity in the mid 1970s. Our economy's ecological footprint now exceeds the capacity of natural systems to regenerate resources at the rate we use them and to absorb wastes at the rate we generate them. And we are moving further away from the equilibrium. A majority of environmental scientists broadly agree with this outlook.

A factor 10 challenge

Things got somewhat better because of the inexhaustible creativity of people who through vision and foresight (but also lessons from accidents and public pressure) improved the efficiency and safety of the production-consumption cycle. Even the most sceptical environmentalists would agree that we need more change to maintain what they see as improving conditions. Another doubling of economic output also needs a doubling of efficiency in resources use. But that would leave pollution levels where they are. We also need another efficiency gain of at least 30% to reduce what WWF estimates as a current overshoot of our biocapacity. This would still leave about 80% of the population in poverty. Taking all the world's population into a similar quality of life range would require the most significant boost to physical efficiency: a factor 5. The most demanding perspective on a sustainable future therefore creates an efficiency challenge of a full order of magnitude.

Whether one is a proponent of factor 10 or 2 will continue to be a matter of debate and of how we look at the world we want to have in the next generation. But there is no denying that innovation will be at the core of all the strategies that have a chance to cope with the trends enumerated above. Incremental change alone will not get us where we should be in 2025.

Eco-efficiency triggers innovation

Innovation cuts through paradoxes. It is the creation of solutions to conflicting demands. Flying in a vacuum gave us rockets and satellites; switching electrons through insulators gave us Silicon Valley and the digital age. Sustainable development presents a similar field of paradoxical innovation forces. To provide affordable products and services for the growing unmet needs of the world population while reducing environmental impacts – this is what eco-efficiency is about, an approach defined by the WBCSD in the early 1990s.[4] The designer Craig Frazier once said that "discomfort is almost a prerequisite for a great idea".[5]

If factor 10 is not an innovation challenge, nothing is. But how does one turn the challenge into a business opportunity?

Successful business innovation depends on four critical elements:

- creative people;
- a stimulating work environment;
- the competence to deliver cost-efficient solutions that exceed customers' expectations and competitors' solutions; and
- a compelling purpose or vision.

When competent companies adopt the principle of eco-efficiency, they turn out important innovations. Take the line of polymers from Cargill Dow that sets a new benchmark for cost performance for fibres and plastics from corn-derived natural sugars. Or Toyota's hybrid technology engines for the Prius, a car that doubled energy efficiency in no more than three years from concept to commercial launch. Or Aventis Pasteur's commitment to create affordable vaccines for immunization in poor countries.[6]

Harvard Professor Michael Porter sums it up: "Innovative corporate practices in the area of the environment, then, will often enhance international competitiveness. Products that address environmental scarcities will also have enormous market potential."[7] Not all business people see this opportunity. The majority of all managers aim for their business objectives at the lowest cost. They are "denominator" managers, a majority. Their pride is in achieving results at or below budget. They tend to realistic objectives, proven approaches and incremental improvement. They are devoted to cost-benefit evaluation, they are trade-off believers and, yes, sceptical environmentalists. But the innovators drive for the highest business impact from a given investment. They are "numerator managers", a minority of leaders in their sectors. They often exceed their goals and sometimes their budget. They are not afraid of extreme goals, "going to zero" waste, accidents, defects or house gas emissions. They are masters of paradox who see a creative connection between conflicting demands.

The two types of managers confront the same business situations with similar budgets. Yet their different worldviews bring large differences in results and competitive strength. The challenge of sustainable development (this concept itself often labelled an oxymoron) needs the worldview of the innovators.

DuPont: "zero" targets driving innovation

Founded in 1802, DuPont is a science company delivering science-based solutions from operations in 70 countries with 83,000 employees. The DuPont mission is to achieve "sustainable growth", which is defined as creating shareholder and societal value while reducing footprint throughout the value chain. Paul Tebo, Vice President for safety, health and environment, has been a driving force behind implementing sustainable growth within DuPont. Tebo has been spreading the vision to DuPont businesses world-wide, setting challenging targets based on elimination of all injuries, illnesses, incidents, wastes and emissions throughout the value chain. In short, "The Goal is Zero". The critical aspect of this goal is that businesses must still grow while driving towards zero.

The Goal is Zero impacts each of DuPont's core strategies, from improving productivity to increasing knowledge intensity, and finally to delivering new products through integrated science. The mission of sustainable growth is creating alignment between business strategies and societal expectations, and the Goal of Zero is driving new innovations within the company.

Innovations include progress on reducing waste and emissions at DuPont sites. A global team developed new technology for the manufacture of Terathane® brand PTMEG, a key raw material for Lycra®. The innovation increased yields, resulting in additional revenues of $4 million while eliminating two million kilos of waste per year.

Another team developed and implemented methods to reduce approximately three million pounds of annual releases of HFC-23 through process optimization. This innovation saved $20 million in capital investment and reduced greenhouse gas emissions on a CO_2 equivalent basis by 18 million tonnes. In Asturias, Spain, the Sontora® business determined that second quality material could be used productively rather than be waste. With the assistance of Dupont and some other local organizations, a group of unemployed women formed Novatex S.A. to take the second quality Sontora® and produce one-time use products for medical and laboratory applications. Novatex is now a stable business with 13 direct and stable jobs for women who previously had difficulties being hired in the local economy, while material that was formerly waste is now a valuable product.[8]

Innovators move before they have to, through foresight or vision. They assume that events, customer preferences and public policy will erode their current product portfolio. Where then are the next sources of growth? Bet on dematerialization, energy and fresh water conservation, safe and healthy food, all at no price premium. Bet on meeting the needs of the billion poorest for sanitation, health and housing. Bet on mobility with little or no carbon combustion, on agriculture without nitrates run-off. Bet on knowledge, design skills and new partnerships rather than mines, oil fields or smelters.

Where is the market share?

Before getting carried away, let's also realize that great market potential is not yet great market share. Today we have today the 3-litre car (Volkswagen Polo) and the cleaner hybrid engine (Toyota Prius). We have mobility services that substitute car ownership with elegant rental solutions. We have compact fluorescent light bulbs. Rapid innovation has brought those products and services to the market with energy efficiency gains ranging from factor 2 to 5. Yet large market success is still wanting.

Although many claim that energy is expensive, its price is not sufficient to move consumers massively towards technologies that would save them costs and energy. Hybrid powered cars or compact fluorescent light bulbs include a price premium that is soon recovered after some months of use. Mobility services or 3-litre cars even present a cash flow advantage from day one, but require a significant adjustment in the driver's habits and self-image. At the current price level of energy or road and parking access (if any) the majority of consumers do not feel an incentive for change. In most cases eco-efficient products and services meet an early-adopters, fringe market situation rather than storming the market to establish dominant eco-efficient patterns of consumption.

Beyond eco-efficiency

Eco-efficiency gains are critical to sustainable development. But they are not sufficient. They must also take over the behaviour of a majority of producers and consumers. For this they must out-compete less efficient solutions in the marketplace. But markets are human arrangements. They reflect human conventions and preferences. For ages, through times of war and peace, our societies have ignored the value of water, space, clean air. They have channelled state subsidies towards fossil fuels, agriculture and transport intensity. In a study by the International Institute for Sustainable Development, Myers and Kent estimated the world's total subsidies towards unsustainable practices to reach $1895 million, with the lion's share going to road transport.[9] In this situation the market signals point us in the wrong direction: it is affordable to overuse water, energy or natural space.

The economic consequences of waste and pollution are underestimated and detached from those who cause them. Likewise many common goods – clean air, stable climate, fresh water security, abundant fish stocks and marine life, pollinating insects or the stratospheric ozone shield – send no direct price signals. Their value remains unnoticed in monetary terms. They remain silent market externalities as long as there are no system breakdowns or not enough defenders of their integrity. Meanwhile consumers and suppliers will use and misuse common goods without an economic penalty. This is changing through science, breakdowns, and regulation and the use of economic steering instruments. But we have become complacent about our current arrangements. In a "free" albeit distorted market, attempts by governments to provide a competitive premium for eco-efficient solutions would necessarily shake the status quo. They are therefore slow and prudent in the face of the resistance from consumers and business.

All-out innovation

Yet the challenge of sustainable development will not be solved in slow motion. While we need innovation in product and services design from the business side, we also need innovation in policy-making to tackle the sticky challenge of getting the market to reward this innovation seriously and efficiently. We need innovation in the social and political dialogue to create transition scenarios where change does not create losers and social stress. On the contrary, they must create incentives for those companies, regions and states that invest in the knowledge, skills and technologies to create eco-efficient products and services.

We also need to start on the right footing in the poorest regions of the world. The challenge of eco-efficiency there is exacerbated by the challenge to jump-start economic development and functioning governance. This requires significant breakthroughs in the affordability of eco-efficient solutions. Consumers with $2 a day or on micro-credit are an opportunity for innovators who can think about new pricing schemes and cost structures.

When business people and politicians embrace the goals of sustainable development to contribute to an economy that works for all within the limits of our ecological base, they indeed embrace innovation as a way of life. It will not just be about technology and economics, but also about framing the market and about creating new partnerships across the traditional boundaries of business and politics.

Adapted from a chapter written by the author for the book Eco-Efficiency and Beyond: Toward the Sustainable Enterprise, edited by E.U. von Weizsaecker, C. Liedtke and J.D Seiler-Hausmann, Greenleaf Publishing, Sheffield, UK (forthcoming, 2003).

Notes

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Making it happen: investing in sustainability

Summary
Mainstreaming and integrating cleaner production into decision-making processes makes business sense. The main challenge is to mainstream and integrate preventive approaches and efficient resource management into the investment decision-making process – in government policy, company practice and the due diligence process of financial institutions.

Résumé
Prendre en compte et intégrer la production plus propre dans l'entreprise et dans les processus décisionnels présente un intérêt économique incontestable. Le principal défi est d'intégrer les démarches préventives et une gestion efficace des ressources dans le processus décisionnel relatif aux investissements : dans la politique des gouvernements, dans la pratique des entreprises et dans le processus d'obligation de diligence des institutions financières.

Resumen
Desde el punto de vista empresarial es importante integrar conceptos de producción más limpia en los procesos de toma de decisiones. El mayor desafío consiste en la integración de propuestas preventivas y sistemas de gestión ambiental efectivos en los procesos de evaluación de inversiones – en políticas gubernamentales, prácticas empresariales y políticas de inversión de companías financieras.

The objective of this paper is to convey the following points:

- Despite increasing awareness by business decision-makers and asset managers of the importance of socially responsible investment, understanding of the economic merits of preventive approaches and efficient resource management remains limited;
- Cleaner production[1] is a part of the development agenda for the business community, not an item of overhead;
- There are examples of initiatives and mechanisms to overcome barriers to financing cleaner production investments;
- Mainstreaming and integrating cleaner production into decision-making processes makes business sense;
- cleaner production helps increase companies' shareholder value (or companies' value);
- cleaner production fosters the development of new knowledge that applies to the whole product/service process life cycle as well as value chains;
- As cleaner production triggers the creation of knowledge, it indirectly contributes to job creation, enhanced competitiveness and, to some extent, innovation.

Introduction

Prevention is better business than allowing production cycle inefficiencies to create losses. The cleaner production community knows and believes in this. Indeed, cleaner production has made tremendous headway in the engineering community in the last ten years. However, most providers of investment and financing remain unaware, or unconvinced. As a result, financing is still seen as one of the main constraints for wider pollution prevention practice.

This does not mean that there has not been a flurry of activity and progress in this field. Research initiatives in issues related to sustainable finance have multiplied, donor agencies have launched demonstration projects, and special cleaner production financial mechanisms continue to emerge in a number of countries as they have done over the last few years.

At the same time, financial markets are becoming more sensitive to issues related to sustainability, particularly environment. Sustainability issues influence both risk and return. Recent evidence shows that institutional investors are also increasingly supporting sustainability.

The key challenge is to mainstream and integrate preventive approaches and efficient resource management into the investment decision-making process in government policy, company practice and financial institutions' due diligence process.

UNEP/DTIE has been implementing the project "Strategies and Mechanisms for Promoting cleaner production Investments in Developing Countries"[2] since 1999. The lessons learned in the five project demonstration countries and through the greatly intensified global debate on this topic form the basis of the issues in this article. The article summarizes these lessons and the main deliverables available from the project to global application and use, including training modules and checklists. It also attempts to highlight the most recent trends in the global debate related to cleaner production financing and its relevance to the financial community.

Stakeholders

The number of stakeholders in activities related to the promotion of cleaner production investment financing has expanded considerably during the last few years. Some stakeholders have an important role in raising awareness, providing technical advice, disseminating information, training, etc. Others provide a policy and regulatory framework and financial resources. Potential stakeholders include:

- International financial institutions (private and public);
- Multilateral financial institutions (World Bank, IFC, regional development banks, national development finance institutions in OECD countries, etc.);
- Export Credit Agencies (ECAs);
- foundations;
- Ministries of economy and finance;
- Chambers of industry and other representatives of the business community;
- Cleaner production service providers;
- Academic and educational institutions specialized in finance , business planning and administration, accounting, engineering;
- the media.

UNEP project outputs

The immediate objective of the UNEP/DTIE project (see Introduction above) was to facilitate the financing of cleaner production investments in developing countries (Guatemala, Nicaragua, Tanzania, Vietnam and Zimbabwe) by:

- demonstrating how to initiate and facilitate the financing of cleaner production investments through the case of the five developing countries;
- developing financing instruments for effectively promoting cleaner production investments in developing countries and designing enabling strategies for supporting public and private financial institutions and the industrial community to adopt these financing instruments;
- motivating key decision-makers in the international community and the public and private financial sectors to pursue cleaner production investments in developing countries.

The first activity was a study on past investment practices in eight countries, and the outcome of this study was reviewed in the background paper for the parallel session on financing at the Sixth International cleaner production High-level Seminar (CP6) in Montreal in October 2000.

Core teams of national experts (financial analysts and cleaner production promoters) have been built in the five demonstration countries, with new skills to assist the industrial community in increasing the demand for cleaner production investments (e.g. preparation of bank loan applications) and the financial sector in assessing the merits of these proposals.

Portfolios of cleaner production loan applications have been prepared in each country with selected local industries,[3] amounting to some 50 projects with investment unitary value ranging from US $5,000 to US $4 million. These investment proposals have also served as valuable cases for local capacity building and the teams of national experts have promoted them among potential sources of financing. So far, five have been financed and implemented (in Zimbabwe).

Based on the results of training needs assessments conducted in the five countries, and in partnership with several international institutions, the UNEP project developed a menu of four training courses:

CP1 – Introduction to cleaner production concept and practice (1-day awareness course)

CP2 – Introduction to capital budgeting and financing of capital projects (1-day awareness course)

CP3 – Profiting from cleaner production (2-day skill course)

CP4 – Cleaner production investment process (2-day skill course)

These were adapted to local conditions and implemented in all the five demonstration countries (in English, Spanish and Vietnamese). Over 100 courses have been delivered with more than 2,000 participants. The target audiences have included political decision-makers in national and local government authorities, company managers, engineers, accountants, bank loan assessors, academia, and the media. As a result, active cleaner production promotion networks have emerged in some of the countries with a much broader range of stakeholders than before. Many of the partner institutions hosting the courses are in the process of adapting some of the material to their own curricula, thus contributing to mainstreaming cleaner production into courses on business management, accounting and financial analysis.

Components of these courses have also been used in global and regional training events for the benefit of, for example, the Directors of UNEP/UNIDO National cleaner production Centres (NCPCs) and bankers from developing countries and economies in transition.

As a result of the project field experience and based on the recommendations of an Expert Group Meeting on UNEP Capacity Building Material to Promote cleaner production Investments (held in Paris 27-28 November 2001), UNEP/DTIE published the following in September 2002:

- a booklet "Profiting from Cleaner Production – Journey to Efficient Resource Management" for senior and middle management in government, finance and business;
- executive awareness-raising slide presentations on "Profiting from Cleaner Production" for industry, financiers and government;
- checklists to facilitate decision-making related to cleaner production investments;
- generic training modules (see four courses above);
- a trainer's guide.

In addition to training, the project has also carried out missions and organized workshops on innovative financing schemes in all five demonstration countries. In the long run, cleaner production investments should not normally need subsidized financing. They can have incremental effects on the cash flow and net income of enterprises, but often do not provide much in terms of collateral. Following fact-finding missions, concrete proposals for a cleaner production dedicated financial mechanism have been made for the consideration of the government (policies and regulations), local financial community (financing) and potential donors (support to promotional projects) in each demonstration country.

Lessons learned

Work carried out under the UNEP/DTIE project, particularly through workshops and contribution to various regional cleaner production Roundtables and draft articles compiled by UNEP/DTIE for the special issue on financing of the *Journal of Cleaner Production*, has resulted in a number of conclusions and recommendations which are presented below. To put these elements into a functional context, it is important to first recall a number of basic facts concerning cleaner production. Commonly held misconceptions have often prevented the adoption of useful preventive measures in the past:

- cleaner production is frequently an investment with a return. Spending money on repairs or on environment control is more properly a capital cost. This makes cleaner production an opportunity, part of the development agenda, not an item of cost.
- Prevention of loss – whether of materials, products or money – is a matter for mainstream business managers, including financial controllers. As a loss prevention strategy, cleaner production increases productivity and business security, thereby justifying the extra expenditures.
- cleaner production is concerned with long-term profitability. Current financial policy, particularly in developing countries, is often short-term. cleaner production financing aims to overcome this barrier.
- cleaner production is a strategy that requires a change in attitude and behaviour for dissemination across the entire spectrum of stakeholders from production engineers to accountants, financial analysts and managers, government policy makers and academia.

Mainstreaming – the company perspective

Cleaner production requires thinking about the life-cycle assessment of consumption, production and distribution, using the analytical results of design and operation. This behaviour of looking beyond the immediate necessities of a project must be promoted as an element of good management, risk reduction, social responsibility and competitive advantage.

Cleaner production investments can strengthen the financial situation of a banker's client and reduce risks of loan default caused by fines, non-compliance, clean-up costs, etc. The challenge ahead is to create added value by integrating preventive approaches and efficient resource management into the strategic and management processes of a company. It is the Chief Executive Officer who has the prime responsibility for environmental management of an enterprise, not the environmental engineer.

Role of cost accounting

There is a need for increased emphasis on costing and on environmental management accounting (EMA) as tools to promote cleaner production and improve cash-generating capacity at the enterprise level because "what you can measure, you can manage". Currently, several institutions promoting cleaner production are also involved in the UN-led Expert Working Group on "Improving the role of government in the promotion of EMA". The UNEP/DTIE cleaner production Financing Project has forged close links with the Working Group and EMA, and costing is a key component in one of the two skill courses (CP3 "Profiting from Cleaner Production") developed under the project.

There are several examples in developing countries and economies in transition. The current NCPC in Zimbabwe (SIRDC-ERSI) used demonstration companies from the recent DANIDA-funded cleaner production project to illustrate the concept of EMA to the Trust Bank, as well as the economic benefits accrued by the company implementing cleaner production. As a result, the bank's credit line for export-oriented SMEs promotes investments with an environmental management component. In the Philippines, EMA is a key instrument in promoting the cleaner production concept among the business community. The cleaner production Centres in Hungary and Slovakia are active participants in the UN-led global dialogue to advance EMA. The recent UN-DESA publication "Environmental Management Accounting Procedures and Principles" was introduced to the Directors of the UNEP/UNIDO NCPCs at their annual meeting in Seoul in November 2001.

Role of public policies

Transparent and effective governance is crucial in mobilizing domestic resources and averting investment flight. Government commitment is equally essential in creating a market reality that will interest financial institutions in preventive approaches. Stable macroeconomic conditions and specific policy measures aimed at creating or fostering an effective institutional framework (e.g. removal of trade and investment barriers, tax concessions, loan guarantees, realistic pricing of utilities) together with an efficient enforcement system, are all conducive to sustainable investment patterns. In this sense, more institutional support to governments of less developed countries would be necessary to enable them to develop effective legislation, market-based policies and instruments for sustained investments, particularly private ones.

Asset managers' perspective

The Institute of Environmental Management and Business Administration at the European Business

School (Johannes Schmidt) has carried out research on sustainability and shareholder value. The summary concludes that:

- The market for environmental and sustainable investment can be an important driver for the promotion of sustainable development.
- Transparency of criteria, methods and products is a basic precondition for the further development of the market, especially for the so-called best-in-class funds.
- By maximizing on the potential to economise the process of gathering and processing of information, efficiency can be enhanced and transaction costs reduced.
- Among the "top-five" environmental criteria for value drive from the sustainability analysts' point of view, three relate directly to cleaner production: "reduction of resource input in processes", "reduction of resource input in products" and "minimizing the probability of accidents". The other two are: "environmental standards" and "risk management systems".

Innovative financing programmes

Although regular commercial sources should be the main methods of financing new and retrofit cleaner production investments, revolving funds, energy efficiency windows, loan guarantee schemes for SMEs and innovative schemes have proven to be useful in jump-starting the process and introducing the concept to banks and industries, particularly in developing countries and economies in transition.

Several such examples can be cited. The revolving fund for cleaner production investments for the Baltic States and North-West Russia by NEFCO is now well established and very successful. Similar donor-sponsored initiatives have emerged in various regions, for instance, the Asian Development Bank, KfW and the EBRD operated schemes. Perhaps less known are initiatives driven by private sector banks. The Trust Bank in Zimbabwe has concluded an alliance with the new NCPC (SIRDC-ERSI) to bring various industrial clients and the bank together to continue to promote cleaner production financing. Under the UNEP/DTIE project, a cleaner production Credit Programme has been proposed for consideration by several countries in Latin America. The scheme foresees that funds providers (e.g. international green funds) channel resources to a local commercial bank or financial institution (including micro-financiers) for the benefit of particularly small and medium-sized entrepreneurs. Local business providers (most notably the local cleaner production Centre) will be the key link between companies and fund providers, assisting the borrowers in performing investment analyses and preparing loan applications.

Introducing cleaner production into an enterprise often improves cash flow, but normally does not increase collateral. So, in some countries, promoting cleaner production investment in SMEs would require loan guarantee schemes rather than revolving funds. Combinations of the two may need to be considered. Such facilities may provide funds at rates that are slightly below the prevailing commercial ones in the same country. However, the approved investment projects should always meet strict commercial criteria and the fund be administered and channelled through professional financial institutions, preferably local. As the understanding of the economic merits of cleaner production and efficient resource management spreads in the country and the demand for investment increases, such special credit facilities should gradually be accompanied by funding through the regular financial products available on the market.

New investment and SMEs

Retrofitting factories will be insufficient in the long run. The greatest challenge will be influencing new investment, particularly among SMEs, to incorporate cleaner production principles. New approaches must be developed to find and work with intervention points so that investors and designers can learn about cleaner production methods and resources, and be rewarded for their efforts to incorporate cleaner production principles.

SMEs play a crucial role in the growth and industrialization of most developing countries. SMEs that are actively pursuing cleaner production have unusually strong and visionary management that pays attention to all aspects of production. These are good signals for future business performance and should be promoted to financial institutions. Local governments should introduce measures to favour SME investments into cleaner production solutions.

Assuming that business providers of special cleaner production services, such as investment appraisals and expert advice, will be set up in national investment co-ordination boards or work in co-operation with them, furthering cleaner production should deal with the following issues and provide the following benefits:

- minimizing inefficiencies in industrial production (e.g. by limiting the demand for public utility services, which are often subsidised);
- ensuring that long-term sustainability is also considered in terms of competitiveness and employment generation;
- providing a means of checking officially that investments do not take the form of environmental dumping;
- giving relevant investment bodies the authority and capacity to provide certification as the following:
  - certificates stating that planned new investments comply with the standards that may be required by foreign lenders and guarantors, thus increasing the accessibility of foreign financing for new investments or securing such financing at more competitive costs.
  - certificates for individual investments and global agreements with foreign export credit and export credit guarantee agencies to attract their participation.
  - certification of new investments to ensure that these get access to international markets, including such environmentally conscious markets as those related to green procurement.

Measures should also be encouraged both by government and industry to integrate cleaner production in supply chain decisions involving SMEs, whereby corporations could play an important role. In the same light, more effort should be put into building a group of public and private procurement professionals conversant with cleaner production and eco-efficiency.

Capacity building – the path ahead

Well-functioning advisory services are needed to assist companies in preparing project proposals and loan applications, which can also be of great value to financiers in securing solid baselines, supervizing project implementation and monitoring project results. cleaner production Centres should focus on catalyzing behavioural change in policy and investment decision-makers.

The UNEP cleaner production Financing Project generated a number of checklists and training packages (see "UNEP project outputs" above). There is a clear demand to disseminate this material to countries and regions not covered by the four-year pilot project. In addition, core teams of trainers need to be trained to be able to deliver such knowledge, through business schools and other educational institutions operating at the national level. UNEP/DTIE has prepared project concepts and started a dialogue with a number of potential partners to:

- translate the capacity building material into Chinese, French and Russian and train core groups of experts in those language areas;
- identify national institutions to host training activities;
- prepare loan applications with business;
- carry out extensive training programmes in selected countries in Asia, Africa, Eastern Europe and Latin America;
- continue contributing to environmentally related training workshops for financial intermediaries organized by development finance institutions; and
- integrate preventive principles in the training programmes of the UNEP Financing Initiatives.

Outcomes

The panel consisted on representatives from an asset management company, development finance institution with a focus on the private sector, a commercial bank in Europe, and a government ministry, micro finance institution and a consulting company in a developing country. The session commented and generally endorsed the background paper.

The conclusions emphasized the need for, *inter alia*:

- addressing the value systems of decision makers;
- internal cost management in enterprises to support assessment of CP projects by financial institutions;
- benchmarking and monitoring of customers' environmental performance by loan managers in micro finance institutions; and
- commercial banks to focus in their environmental risk assessment, emerging regulation and anticipated pressures coming through the supply chain.

The recommendations of the session highlighted the importance of:

- evaluation of macro conditions before moving to micro ones;
- improvement of company accounting practices to reflect the true cost of waste and its management, environmental compliance and risk;
- awareness raising and capacity building, particularly at decision-making levels and media;
- targeted funds and customised decision-making in banks towards CP; and
- focus on cash flow implications instead of collateral.

Notes

1. For the purposes of this article , cleaner production, pollution prevention, preventive approach, efficient resource management and eco-efficiency are used as parallel concepts.
2. Referred to as the "Cleaner Production Financing Project".
3. Most of these cases come from the textile, pulp and paper, metal mechanics, food-processing and tannery sectors.

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Inherently Safer Production, a natural complement to cleaner production

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Summary

Inherent Safety – an approach involving the use of processes and materials with little or no toxicity, flammability or instability – is generally recognized as an important concept in the design of chemical plants. Inspired by the successful development of cleaner production, a feasibility study was conducted for a similar development towards Inherently Safer Production. In four pilot cases carried out in 1997-98, a methodology to generate Inherently Safer technological options was developed and tested. The study indicated that the majority of options had payback times of less than two years, and that Inherently Safer Production was a feasible concept with great potential for simultaneous improvement of safety and economic performance and for integration into cleaner production programmes.

Résumé

La sûreté intrinsèque (qui consiste à utiliser des procédés et matériaux peu ou pas toxiques, inflammables ou instables) est généralement considérée comme un concept important pour la conception des usines de produits chimiques. Devant le succès de la production plus propre, une étude de faisabilité a été menée sur une évolution semblable vers une production intrinsèquement plus sûre. Une méthodologie pour produire des options technologiques intrinsèquement plus sûres a été élaborée et testée dans quatre expérimentations pilotes effectuées en 1997-1998. L'étude montre que la majorité des options étaient amorties en moins de deux ans et que la production intrinsèquement plus sûre était un concept faisable, qui offre un fort potentiel d'amélioration simultanée de la sûreté et des performances économiques, mais aussi d'intégration dans les programmes de production plus propre.

Resumen

La seguridad intrinseca – un concepto que se refiere al uso de procesos y materiales de baja toxicidad, no inflamables o inestables – generalmente es un elemento importante en el diseño de plantas químicas. Alentados por la evolución exitosa del concepto de producción más limpia, se realizó un estudio de factibilidad para desarrollar de manera similar el concepto de Producción Inherentemente más Segura. En 1997-98 se efectuaron cuatro experiencias piloto donde se desarrolló y evaluó una metodología para generar opciones tecnológicas Inherentemente más Seguras. El estudio demostró que la mayoría de las opciones tenía períodos de retorno de inversión de menos de dos años, y que Producción Inherentemente más Segura era un concepto factible con gran potencial para mejorar simultáneamente la seguridad y el rendimiento económico y para la integración con programas de producción más limpia.

Most chemical production involves "transformation" processes, which are inherently complex and tightly coupled. "Normal accidents" are an unavoidable risk of systems with these characteristics (Perrow, 1984). Alternative chemical processes exist that almost completely eliminate the use of highly toxic, volatile, or flammable chemicals. Accidents in these systems result in significantly less harmful chemical reactions or releases. Inherent Safety makes chemical plants also less vulnerable to sabotage and terrorism.

The concept of Inherent Safety is now well known among chemical engineers as a sound set of principles for the design of new facilities and is developed into a vital part of the curricula of engineering schools in several parts of the world. But Inherent Safety is only seldom used to improve existing plants and plays a minor role (if any) in the dominant approaches to safety management.

Inherent Safety can and should be used in existing facilities. However, implementation is limited since it is perceived as an engineering function and due to conceptual and institutional barriers of Inherently Safer Technologies (Kletz, 1998). Stimulated by the successful development and dissemination of the concept of cleaner production, a feasibility study has been conducted for a similar development towards Inherently Safer Production.

Inherently Safer Production departs from the conventional notion of safety management. The traditional approach entails identification of hazards of the existing situation in existing production processes, assessment of the associated risks and minimization of these risks. By contrast, the

Inherently Safer Production approach involves the identification of hazards and risks, the search for and evaluation of alternative technological options, and elimination or reduction of hazards by implementing Inherently Safer Technological Options. In both safety management approaches, organizational and human aspects are just as important as technological factors. The Inherently Safer Production approach is, however, more future-oriented and deals more proactively with technological options, while traditional safety management tends to focus on management of the present technology.

Inspiration from cleaner production approaches

While replacement of existing production systems with benign chemical or non-chemical processes has conventionally focused on cleaner production, the focus can be expanded to include Inherent Safety.

Inherent Safety is similar to - or a natural extension of - cleaner production. Both address technological aspects and organizational and human factors and attempt to prevent the possibility of harm from accidents or pollution by eliminating the problem at its source. Both typically involve fundamental changes in production technology: substitution of inputs, process redesign and re-engineering, and/or final product reformulation. In order to investigate whether similar approaches used in cleaner production programmes can help identify Inherently Safer Technological Options and whether such options would be economically attractive, a feasibility study has been undertaken.

The approach

The methodology comprises a safety analogue of the methodologies in cleaner production demonstration projects and knowledge of Inherent Safety principles. The underlying concept was to encourage firms to prevent accidents and accidental releases by identifying: 1) what changes in the production process to inherently safer inputs, processes, final products and equipment could be made, i.e. Inherent Safety Opportunity Audits (ISOAs), and 2) the specific inherently safer technologies that could be used, i.e. Technology Options Analysis (TOAs). Unlike a hazard, risk, or technology assessment, these techniques seek to identify which Inherently Safer Technologies could be implemented.

The basic design principles to generate Inherently Safer Technological Options can be clustered in several ways (e.g. Bollinger et al., 1996; Kletz, 1998). The four categories adopted from the American Center for Chemical Process Safety (Bollinger et al., 1996) are: Minimize, Substitute, Moderate, and Simplify. A fifth principle of Optimal Plant Layout has been added for the Inherent Safety of logistical activities.

The present approach consists of three phases, each comprising several steps and the use of some specific tools. The present aim is not to prove the value of a blueprint methodology, but rather to develop a methodology that enables a change towards Inherently Safer Production while meeting the needs of industry. Thus, the approach can be customized to suit the needs of the respective pilot companies. Two phases that have been added for evaluation purposes are described briefly below.

Table 1
Summary of results in terms of (technological) options

Number of pilots	4	
Locations	Netherlands and Greece	
Total number of options identified	35	
Options implemented during the project (number, percentage)	9	26%
Options implemented in the Dutch cases (number, percentage, n = 21)	8	38%
Options implemented in the Greek cases (number, percentage, n = 14)	1	7%
Average number of options identified per pilot	9	
Economically feasible options (number, percentage)	26	72%
Options where feasibility was not (yet) fully assessed (number, percentage)	7	19%
Options that were not economically feasible (number, percentage)	3	8%

The first phase consists of the following: 1) initiation and obtaining commitment from the firm; 2) initial design and preparation; 3) conducting a safety audit; and 4) selecting specific candidate processes or operations within the firm.

The second phase consists of the following: 1) carrying out a functional review; 2) developing a specific set of search questions; 3) brainstorming for Inherently Safer Options; 4) constructing an information search process on Inherently Safer Options; 5) identifying prospective Inherently Safer Options; 6) designing a consistent set of system changes; 7) carrying out a feasibility study; 8) obtaining commitment from the project team; and 9) providing recommendations to management. The possibility of introducing new hazards (by the adoption of an alternative technology) has been explicitly considered and evaluated in 6).

Stage three aims at implementation and consists of three steps: facilitating decision-making, preparing implementation, and carrying out the implementation.

The two additional stages (solely for research purposes) are: monitoring and evaluating implementation (monitoring actual design changes and progress in implementation), and case evaluation.

Inherent Safety is broadly defined as comprising the hazards relevant for Process Safety (fire, explosion, runaway reaction, etc.), Occupational Safety, Environmental Safety, Product Safety, Acute Effects on Occupational Health, Acute Effects on Community Health or Nuisance, and various types of sudden and accidental releases.

Case studies

After considerable effort, partner firms were engaged to explore the usefulness of the approach in a case study format. In the Netherlands, partnerships were forged with Hoogovens Steel Strip Mill Products (HSSP, today part of Corus) for a pilot in their Hydrochloric Acid Regeneration plant, and with DSM, the logistics department of the Hydro Carbon Unit. In Greece, a partnership was created with ELAIS (Edible Fats and Oils, part of the Unilever Group) for two pilots: one focusing on its present installations in Athens and the other involving the design of a new plant for refining edible oils. Between 1997-1998, researchers from TNO and Ergonomia Ltd. carried out the pilots in the Netherlands and Greece, respectively. The full case studies are published in the projects final report (Zwetsloot & Askounes-Ashford, 1999, pp. 64-120) and were verified by the respective firms. The case findings regarding the methodological impact on the capacity of the firms to adopt an Inherent Safety approach are presented in more detail in the *Journal of Hazardous Materials* (Ashford & Zwetsloot, 2000), as opposed to the concise analysis presented here (Zwetsloot & and Ashford, 2002, in press).

Overall findings

Does the approach lead to the identification of inherently safer (technological) options that are economically feasible?

Several Inherently Safer Technological Options were identified in all four cases, as well as more traditional safety options (**Table 1**). The expert role of technologically oriented consultants and an extensive external data search were important for the identification of (especially the more fundamental) options. Three factors seem to have a positive influence: 1) being early in the life cycle (i.e. at the design stage); 2) an on-site cross-functional workshop on the principles of Inherent Safety that includes a brainstorming session for Inherently Safer Technological Options; and 3) consultants as facilitators in the brainstorming process. Many Inherently Safer Options are shown to have short payback periods. In a time of ever-increasing competition, potential economic incentives for Inherent Safety are evident: greater reliability of production, and economic optimization of operability and maintenance of existing installations.

What are the strengths and weaknesses of the approach?

Although the method has been useful in all four cases, specific considerations required some changes in the approach, which depended mainly on the life-cycle stage of the installation. The enormous effort involved in the (re)engineering and construction of a plant is repaid over the course of the project. While commitment of all parties involved is essential for project success, the commitment of the plant operation "owner" is especially crucial. In current installations, the management is primarily interested in improvements that give a return on investment within one to two years.

The company's capacity for generating, adopting and implementing Inherently Safer Options varied considerably in the four cases. Capacity improvement during the course of the researchers' intervention was even more varied. In the Dutch cases, capacity was increased by the intensive cooperation between the company's personnel and the consultants/researchers in the pilot processes, especially during the workshops held on Inherently Safer Production and Inherently Safer Technology Options. Several initiatives of the respective action plans specifically addressed the plant's capacity to identify, adopt, and implement (future) Inherently Safer Options, although the options generated in workshops with the firm's personnel were not dramatic examples of Inherently Safer Technologies. Many useful secondary prevention options were also identified.

In the Greek cases, the consultants played an important expert role, which had a very positive influence on the creation of far-reaching Inherently Safer Options. However, the consultants were not able to influence the firm to adopt and implement these options or to involve the firm's personnel. External expertise contributes most to the methodology for the initial audit, brainstorming for improvement options and providing external data for more Inherently Safer Technological Options.

Are demonstration projects to stimulate Inherently Safer Production feasible?

This study demonstrates in all four cases that, through application of the approach, substantial progress towards Inherent Safety and a better safety performance can be realized in economically attractive ways, as shown by the numerous Inherently Safer Technological Options identified. Many options identified were not only economically feasible: the majority had payback times of about one or two years.

Participation of the management and personnel is important in implementing the approach in existing plants. However, a company unaccustomed to analysis and process-related problem solving on Inherent Safety needs a two-step approach. First, the problem solving methods are raised so that employees have an opportunity to discuss previous concerns. As participants better understand the framework, a group is formed that can start working on Inherently Safer options. When the improvement projects are defined and the action plan is approved, the employees engaged in brainstorming options should also be involved in the implementation process. This facilitates understanding of the approach and upholding of the commitment to Inherently Safer Production. Overall, it may be concluded that demonstration projects to stimulate Inherently Safer Production are feasible, in existing plants.

Unexpected early improvements in safety and environmental performance

In the HSSP case, the company struggled prior to the project with several persistent issues of safety, environmental and quality, which made improvements in these performances easily identifiable. The greatest progress was realized before the identified options were implemented.

Thirteen of the 14 environmental incidents in 1997 happened in the first half of the year before the plant personnel became involved in the project. One accidental release took place in the half year directly thereafter. In the same period similar progress was made in related areas such as product quality.

What accounted for the dramatic improvement in safety soon after the project began, and before the implementation of the identified Inherently Safer Options? Although there is no scientific evidence, it was apparent to the plant's personnel and managers that the first two phases of the methodology were beneficial. This helped them to better understand the process control and related safety problems and to set clear maintenance priorities and to guide investments for incremental technological improvements. Without additional help from the researchers, they adapted several steps from the first phases of the methodology and used them – successfully – to better understand other process control, environmental and quality problems.

These findings indicate that the interdisciplinary and participatory components in the approach, as developed in the Dutch cases, strengthened the commitment to safety of those involved. It also indicates that the first two phases of our methodology can lead to better communication, cooperation and more fruitful decision-making.

Norway's Environmental Home Guard

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Miljøheimevernet, or the Environmental Home Guard, was launched in Norway in October 1991. It is a network of individuals (over 100,000 to date), groups, organizations and institutions committed to changing their daily activities in ways that reduce use of natural resources, energy and environmentally harmful substances, minimize waste generation, and protect biodiversity.

EHG activities, targeted towards people aged 25 to 50, concentrate on four main areas:

- providing simple, precise and easily understood information on how to make more environmentally friendly choices in everyday situations as individuals, groups and organizations;
- producing tools for voluntary organizations so as to assist them in involving their members and local clubs in environmental protection;
- recruiting individuals and families in a network made up of people who pledge to start changing their habits;
- helping voluntary associations, institutions, schools, companies, kindergartens and housing cooperatives improve their environmental profile.

The movement aims to mobilize those who have the will to contribute to a better environment but do not feel they have the knowledge or skills to become activists.

Tools for change

The key tool is the Action Plan, a list of suggestions that individuals can follow in everyday life. Prospective participants are asked to choose points for their own personal or family Action Plan. Beginners may start with a few simpler tasks: not everyone wants or has the time to hunt down barrels of toxic waste or study local waste disposal plans in depth.

Other EHG materials and activities that help individuals and collectives change to more environmentally friendly consumption patterns include:

- Green Living, a comprehensive programme for households and consumers that identifies a broad spectrum of practical tasks that can be carried out, with factors such as extent of involvement and method of information access established individually;
- *MORE&less*, a quarterly magazine providing up-to-date information on green alternatives, product analyses, activity reports, and innovative ideas and challenges;
- Greenback, an environmental profile test for households (available online at *www.gronnguide.no*), based on questions relating to nine different areas and resulting in a green score, with brief comments on the household's profile;
- the Action Team, a support network of households that meet frequently to examine their everyday habits and to motivate each other towards a greener life;
- Action at Home, an alternative for households that wish to explore greener solutions without joining groups;
- The Green Guide (*www.gronnguide.no*), a web site with basic information on typical environmental issues and over 500 green solutions (in Norwegian) for households and consumers;
- The Green Line, a national hotline for consumers who seek information about green solutions.

One-off publications are also produced. Examples include *The Green Office* (published with the Norwegian Society for the Conservation of Nature); *Think Locally!*, on how organizations can influence local authorities to improve planning and zoning (published with the Norwegian Association of Local Welfare Societies); and *Leaving No Trace Behind*, a guide for fishing, hunting and hiking (published with the Norwegian Association of Hunters and Anglers).

Around half the municipalities in Norway have used EHG materials and programmes to mobilize citizens for greener living. Businesses also use mate-

For the researchers, the successes in these early stages were somewhat unexpected. This indicates that the first two phases of our methodology can be used as a tool for safety management, and can have considerable value separately, apart from the implementation of the (technological) options identified.

Combining cleaner production with Inherently Safer Production activities

The Inherently Safer Production approach presented here is closely related to cleaner production approaches and may be considered the preventive complement of UNEP IE's Emergency Preparedness and Response Programme. For National Cleaner Production Centres it seems a logical extension of their activities, as the methodology for ISP is similar to that of cleaner production.

While National Cleaner Production Centres already have many capabilities that are useful for stimulating Inherently Safer Production, some additional competencies and tools are required. Representatives of the Cleaner Production Centres should undergo training in Inherent Safety principles, safety management and the evaluation of the safety impact of technological options. As the latter may require specialized know-how, networking with some relevant information centres is crucial.

Finally, Inherent Safety is not only relevant in improving environmental safety and preventing sudden and accidental releases, but also in improving occupational safety. In this way ISP may be a direct link between environmental activities and a specific set of social preventive activities. This could be regarded as a step further towards sustainable development as it is increasingly acknowledged that policies for sustainable development should integrate environmental, social and economic aspects.

Recommendations

Based on the results of this research, we would like to take the opportunity to make the following recommendations to UNEP DTIE and the National Cleaner Production Centres:

- In the present era of rapid technological innovations, safety can no longer be guaranteed only through risk management in existing installations. Especially with a view towards sustainable growth, it is vital that more proactive and future-oriented safety approaches are developed.
- The Inherently Safer Production approach provides new perspectives for more innovative safety initiatives. It opens the way for stimulation programmes to help companies or sectors to voluntarily direct Safety Management towards the identification and implementation of Inherently Safer technological options. Such stimulation programmes could be set up separately, but also as an extension of or integrated with stimulation programmes for cleaner production.
- In major accident hazards policies, e.g. the post-Seveso guidance on the preparation of the safety report, associated with the Post Seveso II Directive (EU 1996a), it is often suggested that firms should adopt Inherent Safety approaches as the preferred strategy over traditional safety measures. This study underlines the need to evaluate whether such policies are successful in developing Inherently Safer industries. The research demonstrates that the Inherently Safer Production approach can be useful in this respect. For UNEP DTIE the approach presented may form the bridge between its activities to stimulate cleaner production, and its policies to promote emergency preparedness and response. Today UNEP DTIE has no policy to promote preventive approaches to safety, and Inherently Safer Production seems a logical way to do so. In terms of company practice, the approach presented offers a practical and economically attractive tool that may be integrated in the company's SHE (Safety Health and Environment) Management system.
- From the perspective of environmental policies (such as the EU IPPC directive, EU1996b), the present study is relevant in two ways. First, Inherent Safety includes environmental Inherent Safety. We see Inherent Safety as directly complementary to the traditional cleaner production/pollution prevention approaches, which usually neglect sudden and accidental releases. Secondly, the solutions databases that are available or are presently being developed to support the implementation of cleaner production should preferentially promote tech-

rials and advisers from the EHG to improve their green profile. Companies increasingly see staff awareness-raising concerning the environmental impact of their everyday lives as a valuable contribution to their overall greening strategies.

The EHG does not mean to imply that all environmental problems can be solved by "shopping green". Many issues require politicians and industry to make the right decisions on behalf of the community, e.g. via legislation, taxation and development of better products.

In Norwegian the activities of the EHG are called a *dugnad* – a concept with roots going back many centuries. It means a collective effort, a work-sharing activity in which people contribute as volunteers. The EHG has no local branches, annual meetings, minutes or any of the usual trappings of organizations. The focus is on *ad hoc* activities and local action.

The EHG is an attempt to combine the know-how of the environmental movement with the vast networks of traditional voluntary organizations involved in humanitarian, social and cultural issues, of which Norway has many. The country consists largely of many small communities, spread over a large geographical area with low population density. Voluntary work in clubs and associations is a vital cultural factor in such communities.

In general, the EHG's information and activities are characterized by:

- an optimistic approach, pointing towards solutions and better alternatives;
- a touch of humour;
- simple, direct language;
- use of cultural activities and modes of expression (theatre, music, etc.);
- establishment of personal relations with the target population – when people contact the EHG, they should be met by individuals, not impersonal bureaucrats.

To achieve sustainable consumption through consumer power, the EHG has outlined a strategy based on six coordinated principles:

1. Facilitate greener choices for consumers by providing simple, practical information related to consumption; demand better labelling of products, both general information on contents as well as more specific, independent eco-labelling; and work for a larger choice of greener products at reasonable prices and of acceptable quality.
2. Organize consumers by making them feel they are many individuals thinking and choosing in similar ways; give them the opportunity to commit themselves to start changing their habits and consumption patterns; and ensure that issues for concentrated and joint action are chosen so as to maximize campaigns' effectiveness.
3. Exert pressure from below and from above. For example, large supermarket chains dominate the market for groceries in most western countries. This means a few individuals decide what choice of products is offered in stores and define desirable product qualities for producers and wholesalers. In such a situation, it is most effective to apply pressure to supermarkets from two different directions: from "below" through individual customers and citizens groups, and from "above" through political pressure and lobbying.
4. Open several fronts. Do not rely only on individuals and families to generate pressure for sustainable consumption. The impact on the market is much greater when many different types of institutions (schools, companies, etc.) make similar demands.
5. Build alliances. Environmental organizations have high levels of expertise on ecological issues, while other voluntary organizations have broad networks and contacts with individuals who may not yet be involved in environmental activities. Through alliances between the green movement and other types of voluntary organizations, many more individuals and families can by mobilized for a greener lifestyle.
6. Follow up with political action (campaigns, lobbying, etc.) to improve the collective systems that can facilitate changes in consumption patterns. Examples are taxation, legislation, bans on toxic products, waste sorting systems, improved recycling systems and new recycling industries, and better public transport. Appeals and information to individuals can be counterproductive if poor collective systems prevent people from effecting change.

nologies that both prevent gradual pollution and are inherently safer. As a second best strategy, similar databases of Inherently Safer Technologies could be developed.

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La publicité face aux défis du développement durable

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Summary
Some companies use marketing and communications strategies based on consumers' existing and potential needs. Others, more interested in efforts to make a better world, anticipate trends and are experimenting with new methods. Companies in the latter category have adopted several basic rules, described below, that reflect their adherence to sustainable development criteria.

Résumé
Certaines entreprises choisissent un marketing et une communication fondés sur les besoins existants ou latents du consommateur. D'autres, désireuses de façonner un monde nouveau, anticipent ces tendances et lancent des initiatives nouvelles. Les entreprises qui ont choisi la voie la plus hardie ont formulé quelques règles de base, résumées ci-après, qui reflètent leur adhésion aux critères du développement durable.

Resumen
Algunas companias aplican estrategias de comercialización y comunicación en virtud de las necesidades existentes o potenciales de los consumidores. Otras empresas, interesadas en la construcción de un mundo mejor, anticipan tendencias y experimentan iniciativas novedosas. Estas empresas han adoptado ciertas normas básicas, que se describen a continuación, y que reflejan su adhesión a los criterios de desarrollo sustentable.

La publicité, cette grande méconnue

La publicité est la forme la plus visible de l'ensemble des techniques de communication commerciale. Elle n'en est pas moins l'objet de nombreux malentendus et d'une forte dose d'incompréhension.

Il nous parait donc utile de définir brièvement la communication commerciale, son rôle, ce qu'elle sait faire et ce qu'elle ne peut faire.

La publicité est un processus par lequel des entreprises, mais aussi des individus ou des institutions, dépensent de l'argent pour acheter de l'espace (dans des journaux ou magazines) ou du temps (à la télévision ou à la radio) pour communiquer à un certain public des informations et des idées sur leurs produits et services.

Au fil de l'histoire de la publicité moderne qui couvre moins de cent ans, les spécialistes se sont assez rapidement rendu compte que pour être efficace il ne suffisait pas de dépenser beaucoup d'argent ou de préparer des annonces plus ou moins créatives. On a pu constater à de multiples reprises que des campagnes utililisant des moyens financiers modestes ont prouvé leur efficacité. Le secret de la réussite semble bien résider dans une approche basée sur la manière dont les consommateurs perçoivent les messages qui leur sont adressés.

La communication commerciale doit rendre service au consommateur et elle ne peut réussir que si elle place celui-ci au centre de l'idée publicitaire. Comment le produit ou le service rendra-t-il service au consommateur ? Quels problèmes pourra-t-il résoudre ? Quelle difficulté aidera-t-il à aplanir ? Où le client trouvera-t-il le produit ou service ? Quel en sera le prix ? Quel autre consommateur utilise déjà le produit et pourquoi ? Et surtout, quels sont les mérites particuliers du produit ou du service en comparaison avec les concurrents ? Une entreprise qui apporte des réponses claires à ces questions aura de fortes chances de communiquer efficacement.

La publicité, élément du processus de marketing des entreprises

La publicité ne trouve son espace de travail que dans le cadre d'une activité complète d'entreprise et plus précisément dans le processus du marketing. Le marketing est aussi un concept d'entreprise qui a pour but de satisfaire les besoins du consommateur en lui offrant des biens et services qui répondent à ses aspirations plus efficacement que ceux des concurrents.

> *« Le marketing est une manière de voir l'entreprise du point de vue de son résultat final, soit du point de vue du consommateur »*
>
> Peter Drucker

Un bon marketing – un marketing efficace – exige que tous les collaborateurs de l'entreprise soient convaincus de l'importance :

- du service au client,
- de la qualité constante du produit,
- des bénéfices apportés au consommateur par le produit ou le service,
- des améliorations technologiques chaque fois qu'elles sont possibles,
- d'une tarification qui reflète la qualité réelle du produit,
- d'une communication ciblée vers les clients potentiels du produit,
- de la conscience de l'existence de la concurrence et de la volonté exprimée ou latente du marché.

La communication publicitaire ne sera efficace que si la réflexion marketing a été bien faite en amont. Si tout le monde a bien fait son travail, le cycle de vie du produit commencera et dans 5 à 10 % des cas, le produit trouvera une place stable et profitable dans le marché. Le taux d'échec reste immense puisque plus de 90 % des nouveautés ne survivent pas à la première année d'existence.

Selon le type de marketing choisi, les entreprises sont *guidées par le marché* ou *guident elles-mêmes le marché*. Celles qui servent le marché donnent naissance à des améliorations graduelles de produits et de services, mais ne sont pas à la base de véritables innovations. Celles qui guident le marché modifient les vues des consommateurs et changent notre civilisation en donnant naissance à de nouvelles catégories de produit et en transformant les règles du jeu.

Les trois types de marketing

Selon Philip Kotler, l'un des plus illustres théoriciens du marketing, les entreprises ont le choix entre trois types de marketing : le marketing réactif, le marketing anticipatif ou celui du besoin. Soulignons rapidement les caractéristiques essentielles de ceux-ci :

Le marketing réactif est basé sur le concept " identifier et satisfaire les besoins ". Cela peut fonctionner à condition que le besoin soit préexistant et que la solution existe.

Le marketing anticipatif est censé répondre aux besoins latents. C'est ainsi que l'accroissement du stress en milieu urbain à poussé les laboratoires pharmaceutiques à proposer des antidépresseurs. Le marketing anticipatif est clairement plus risqué que le marketing réactif car on peut arriver top tôt sur le marché ou même se tromper totalement sur l'évolution réelle de celui-ci.

Le marketing du besoin intervient lorsque l'entreprise décide de lancer un produit ou un service que personne n'a demandé ni même imaginé. Akio Morita, fondateur de Sony, a été l'un des plus fervents adeptes de ce type de raisonnement : " Je ne sers pas les marchés, je les crée " était sa devise favorite.

Source : Kotler, Philip, *Kotler on Marketing*, Free Press, a division of Simon and Schuster Inc. New York, 1999

Les limites du pouvoir de la publicité

Cette introduction montre que de croire que la publicité suffit à faire adopter un produit nouveau, une manière différente de faire ou une révolution sociale est une erreur fondamentale partagée par un grand nombre de citoyens de la planète. En effet, nombreux sont ceux qui imaginent que la publicité agit comme un interrupteur électrique qu'il suffit de tourner ou de pousser pour que l'objectif souhaité se réalise. Toutes les facettes de la publicité concernent des êtres humains qui, par nature, sont imprévisibles, et des idées qui sont souvent nouvelles ou simplement non familières. Il n'est donc pas étonnant que la question la plus communément posée par les responsables d'entreprises au moment du démarrage d'une campagne publicitaire est très semblable à celle-ci : « Est-ce que ma publicité va donner des résultats ou les consommateurs vont-ils la rejeter ? ». Dans le meilleur des cas, un certain nombre de consommateurs seront attirés et passeront à l'achat d'essai, mais jamais la campagne de communication ne sera capable de convaincre une très large portion de population. Intéresser tout un chacun est une mission impossible.

Que penser alors des campagnes d'intérêt public ? On a très souvent accordé à la publicité des pouvoirs plus importants qu'elle ne possède réellement et, assez logiquement, on a pensé qu'elle serait utile pour promouvoir des comportements sociaux et combattre la vitesse en automobile, l'ivresse au volant, la tabagie, etc.

Les études ont montré très régulièrement que si le message était compris, il n'était pas nécessairement adopté, la réaction de nombreuses personnes étant du style « Oui, l'excès de vitesse est dangereux, sauf pour moi qui suis un excellent conducteur ! ». Si l'individu ne se sent pas concerné personnellement, le message perd sa réelle efficacité.

C'est ainsi que la publicité ne peut pas faire acheter continuellement un produit non désiré, voire détesté. La publicité peut faire acheter une première fois et puis le produit devra faire ses preuves.

La publicité ne peut forcer quelqu'un à lire ou à regarder des messages pas clairs ou non pertinents, mais elle peut associer des idées pratiques ou des émotions à un produit que les consommateurs se rappelleront peut être lorsqu'ils seront dans un magasin.

La publicité ne peut faire acheter aux gens des quantités de produits supérieures à ce qu'ils utilisent usuellement, mais elle peut les informer d'offres promotionnelles à des prix intéressants.

La publicité n'empêchera pas vos concurrents de vendre, mais elle pourra rendre votre marque plus connue et plus respectée que celles de vos concurrents.

La publicité ne détermine pas le choix du consommateur ni son comportement, mais elle peut influencer ce choix ou ce comportement. La publicité apporte une aide au choix et ne se substitue pas à celui-ci.

Le défi du développement durable

Depuis quelques années, des études de plus en plus nombreuses ont montré que les consommateurs ont des exigences qui dépassent le niveau d'usage des produits qu'ils achètent. Il ne suffit plus que le produit réponde à leurs exigences en terme d'efficacité et de rapport coût/satisfaction. De plus en plus, les consommateurs veulent connaître le rôle joué par le fabricant sur le plan social et environnemental. Durant les années 1970, les inquiétudes étaient concentrées sur les phénomènes de pollution, de disparition de certaines ressources et de croissance de la population mondiale. Les années 1980 ajoutèrent à ces trois questions fondamentales des réflexions en matière d'utilisation des aérosols, des voitures et des détergents. C'est à cette époque que le « consommateur vert » commença à être considéré comme un groupe cible potentiel pour les entreprises. Après le Sommet de Rio de Janeiro de 1992, les années 1990 virent pointer le concept de développement durable qui considère l'avenir de notre planète du triple point de vue économique, social et environnemental. Dix ans après Rio de Janeiro, de plus en plus d'entreprises ont compris que pour être perçu comme un « bon business » il ne suffit plus de mettre sur le marché des produits et services répondant le plus précisément possible aux souhaits des consommateurs, mais que l'ensemble des opérations de l'entreprise doit se dérouler dans le respect d'une éthique forte, prenant en compte les aspects sociaux et l'impact du produit sur l'environnement durant la totalité de son cycle de vie.

> *« Il est devenu de plus en plus évident que les consommateurs sont intéressés de manière de plus en plus forte au monde qui existe au-delà du produit qu'ils achètent. En plus du prix et de la qualité, ils veulent savoir comment, où et par qui le produit a été fabriqué.*
> *Cette prise de conscience croissante de l'environnement et des critères sociaux est un signe d'espoir. Les gouvernements et l'industrie doivent bâtir sur ces fondations. »*
>
> **Klaus Toepfer,**
> **Directeur exécutif,**
> **Programme des Nations Unies**
> **pour l'environnement**

Cette approche constitue un défi majeur pour le marketing car elle remet en cause certains principes fondamentaux de celui-ci. Qu'on le veuille ou non, il reste de très nombreux habitants de notre planète qui ne se soucient pas du tout du triple objectif mis en avant par le concept de développement durable. Ils ne sont pas prêts à écouter des arguments visant à faire préférer des produits « durables » à ceux qui le seraient moins ou pas du tout. Pour peu que les produits « durables » soient un peu plus chers, moins disponibles ou simplement différents de ceux qu'ils utilisent habituellement, ils ne les adopteront pas. Ceci veut dire qu'en tentant de leur vendre des produits

« durables » on ne répondrait pas à leurs besoins ou attentes.

Un autre paradoxe qu'il faudra vaincre est celui qui a été rencontré par les entreprises pionnières en matière de promotion de produits « durables ». Elles ont très souvent été accusées de récupération et de profiter de la « vague verte » pour vendre.

Le « marketing vert » a poussé vers les rayons des supermarchés des produits plus « verts » : des piles sans cadmium, des cosmétiques non testés sur des animaux, etc. Des initiatives ont été prises par de nombreux secteurs industriels en matière de recyclage et de récupération, parfois sous la menace de taxes écologiques. De nombreuses controverses sont nées de ces initiatives et ont rendu prudents les responsables de marketing. Certaines entreprises ont vu leurs gammes de produits « verts » délaissés par les clients et ont été forcées de les abandonner. D'autres ont maintenu le cap malgré les premiers échecs, mais attendent encore très souvent un modeste retour sur les investissements consentis. Pour que le système fonctionne, il faut des produits réellement « durables » ; ils sont souvent plus chers à fabriquer, ils sont vendus en relativement petites quantités car trop peu de consommateurs sont intéressés et les produits contribuent très peu aux profits de l'entreprise. Cela ressemble plus à un cercle vicieux qu'à quoi que ce soit d'autre.

La fonction marketing est traditionnellement placée à la charnière entre l'entreprise et sa clientèle. Son rôle est de trouver un cercle vertueux en essayant de convaincre l'entreprise de prendre en compte dans le développement de nouveaux produits les nouvelles contraintes éthiques, sociales et environnementales tout en trouvant des arguments susceptibles de faire préférer aux consommateurs les produits « durables » plutôt que ceux qui le sont moins.

Les questions à résoudre d'urgence pour rendre le marketing « durable » et apporter ainsi une contribution majeure aux progrès de la planète et de sa population actuelle et future et aux profits des entreprises sont nombreuses :

- Comment l'industrie peut-elle participer à cette nouvelle quête et en profiter ?
- Quels sont les bénéfices que l'industrie peut espérer tirer du respect des nouvelles normes éthiques, sociales et environnementales sur le plan de la réputation, la compétitivité, la reconnaissance sociale et politique ?
- Comment être à l'avant-garde sans être accusé d'opportunisme et de superficialité ?
- L'entreprise a-t-elle le droit (ou le devoir) de tenter de modifier les comportements de consommation de ses clients ?
- Quel rôle la communication commerciale peut-elle jouer pour faire préférer des produits « durables » et, éventuellement, faire rejeter des produits non durables en repositionnant les produits des concurrents comme étant nuisibles dans l'esprit du consommateur ?
- La publicité peut-elle, même pour la bonne cause, déterminer de nouveaux choix de consommation ?

Comme on le voit, répondre à ces questions nécessite de modifier profondément les processus de décision, de fabrication, et de vente des entreprises, mais impose également d'importantes réflexions déontologiques et éthiques.

L'approche de la consommation durable telle qu'avancée par le Programme des Nations Unies pour l'environnement annonce assez clairement la couleur :

> *La consommation durable ne signifie pas consommer moins. Cela peut vouloir dire, consommer différemment et plus intelligemment – plutôt que de réduire la consommation de produits et services – mais cela peut exiger des modifications substantielles dans la manière dont le consommateur se comportera ainsi que des changements dans l'activité des entreprises.*

Qui décidera de ce que doit être le nouveau comportement du consommateur ? Qu'est-ce qu'un bon nouveau comportement ? Voilà deux questions qui seront beaucoup plus difficiles à résoudre que de convaincre les entreprises de s'adapter au contexte nouveau. En effet, depuis que les entreprises existent, elles ont été forcées de s'adapter à un environnement changeant. Celles qui l'on fait trop tard ne sont plus là. La seule question qui se pose réellement à l'entreprise est de savoir avec quelle rapidité évoluer. Et celle-ci est toujours fonction du degré d'implication des clients dans le processus de changement de société.

Pour parvenir à ce changement, il faudra une alliance extrêmement forte et unidirectionnelle des gouvernements, des entreprises, des administrations, des institutions et des citoyens. Les pesanteurs à vaincre sont importantes.

Publicité et développement durable

Nous avons déjà souligné que la publicité ne peut créer de nouveaux comportements. Au contraire, la publicité utilise des comportements de consommation existants pour proposer des solutions allant dans le même sens que ces comportements.

> *« Il est irréaliste de croire que la publicité va lancer une révolution. La publicité n'a pas pour rôle de définir une politique sociale. Mais, la publicité est très efficace pour écouter et réagir à la volonté du public. Et le public semble se rendre compte des coûts de nos comportements extrêmes de consommation. »*
>
> **Jelly Helm, Co-Président**
> **de l'agence Barden & Jelly**

A l'instar de ce qui est prôné par Philip Kotler (voir encadré), les entreprises auront à choisir entre un marketing et une communication puisant leurs racines dans les besoins existants ou latents du consommateur et elles utiliseront les éléments du développement durable au fur et à mesure qu'un nombre croissant de consommateurs sera demandeur de la triple dimension sociale, éthique et environnementale. D'autres, plus hardies et désireuses de façonner un monde nouveau, anticiperont ces tendances et lanceront des initiatives nouvelles non encore demandées ou exigées par les consommateurs.

De très nombreux exemples existent déjà. Nous citerons le cas de la Société Kellogg's en Australie. Une ligne téléphonique d'appel à l'aide créée pour les enfants sous le nom de « Kids Line » ne pouvait répondre utilement qu'à la moitié des 1,5 millions d'appels annuels. Un partenariat entre Kids Line et Kellogg's permit de recueillir 500.000 $ australiens qui ouvrirent la possibilité de répondre à 150.000 appels supplémentaires. La campagne publicitaire comprenait des annonces dans les médias traditionnels, des activités grand public ainsi qu'un message sur sept millions de boîtes de céréales.

Quelques pistes à suivre

Les entreprises qui ont choisi la voie la plus active ont énoncé quelques règles de base qui pourront utilement inspirer ceux qui désirent montrer leur adhésion aux critères du développement durable en utilisant leurs dépenses en communication pour accélérer la prise de conscience des consommateurs. Nous les avons résumées ci-après.

Les actions à entreprendre :

- utilisez vos marques pour communiquer sur des thèmes sociaux et environnementaux ;
- assurez la promotion de vos marques en liant les ventes à des contributions financières au bénéfice d'initiatives concernant ces mêmes thèmes ;
- forgez un partenariat avec une O.N.G. reconnue pour son efficacité sur le terrain et créez une synergie avec votre marque ;
- n'oubliez pas de communiquer au sujet de ces initiatives avec tous les départements de l'entreprise. Ce doit être l'affaire de tous et pas uniquement l'affaire du département marketing ;
- confiez l'audit social et environnemental de votre marque à un spécialiste externe pour chaque étape du cycle de vie de vos produits ;
- songez à utiliser des marques de conformité écologiques ou sociologiques (écolabel et label social) tout en restant conscient que de fausses allégations en ce domaine peuvent être extrêmement dangereuses pour la réputation de votre marque.

Si votre travail est bien fait, vous pourrez espérer obtenir de bons résultats au profit de :

Votre marque :

- augmentation des ventes ;
- différenciation de votre marque sur un marché saturé ;
- ouverture de nouvelles pistes de marketing.

Vos clients :

- ceux-ci préféreront acheter une marque qui soutient des projets proches de leur sensibilité et de leurs objectifs personnels.

Les causes sociales et environnementales :

- publicité et association avec des grandes marques réputées ;
- accès aux ressources et réseaux des grandes entreprises ;
- rentrées financières en provenance des opérations de marketing en faveur des grandes causes.

La voie des partenariats est également riche de possibilités. Les défis à relever sont tels que de grandes alliances seront nécessaires pour arriver à des résultats significatifs. Ces alliances seront de multiples sortes : alliances entre concurrents pour solutionner ensemble de grands problèmes, partenariat avec des organisations non gouvernementales, voire avec des « activistes », pour entamer un dialogue constructif et positif et trouver de nouvelles solutions aux problèmes anciens, avec les clients pour encourager les comportements respectueux de l'environnement (recyclage, par exemple), avec les fournisseurs pour réduire l'impact des systèmes de production, etc.

Les partenariats devront aussi favoriser l'abandon des stratégies de confrontation pour mettre en œuvre une collaboration active. Quel intérêt y-a-t-il à rechercher des coupables si cela doit accaparer les énergies qui seraient plus utiles dans la quête de solutions ?

Nous croyons fermement que les entreprises qui feront savoir qu'elles ont *réellement* choisi comme priorité le développement durable seront finalement récompensées car jamais la jeunesse – les clients de demain – n'a été autant sensibilisée aux enjeux du futur. Ce groupe constituera dans les 10 à 20 ans à venir le fer de lance du changement car les jeunes sont les consommateurs, les employés, les investisseurs, les responsables politiques et sociaux de l'avenir. Il n'est pas présomptueux de penser que leurs critères de consommation et de choix de société seront très différents de ce que nous connaissons aujourd'hui. Ignorer cela, c'est hypothéquer, voire condamner, le futur de nos entreprises.

> *« Les gens voudront et seront capables de trouver de nombreuses informations quant au rôle de bon citoyen d'une marque. Ils voudront savoir si elle fait les bonnes choses du point de vue social, économique et environnemental. »*
>
> **Mike Clasper,**
> **Président Global Home Care & New Business Development, Procter & Gamble, Europe**

Notes

1. La Fédération Mondiale des Annonceurs est une organisation chargée de défendre et de préparer le futur des actions de communication des entreprises. La Fédération représente des milliers d'entreprises au travers des 46 associations nationales d'anonceurs et de 30 multinationales classées dans le TOP 50 des annonceurs mondiaux.

2. Adkins, S. (1999) *Cause Related Marketing, Who Cares Wins.* Butterworth-Heinemann, Oxford.

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Selling sustainability

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We have all seen research from many sources showing that consumers in general are supportive of sustainable ideals and want to be reassured that manufacturers are responsible. Yet the lack of obvious reflection of this attitude in actual consumption and lifestyle has raised many questions. Research has shown that consumers don't see a personal benefit, and that they don't feel threatened or rewarded. They believe they have to pay more for products which do less and are inconvenient, if not impossible to find.

This resistance leads to a vicious circle, in which low consumer uptake leads to less research and development aimed at achieving product performance breakthroughs, as well as low advertising emphasis on sustainable product attributes of products which are launched. The circle can only be broken at the point of consumer attractiveness. Selling sustainability is a matter of leadership from the top down.

In most countries, governments are one of the largest spenders on advertising - but not, it seems, with respect to sustainability issues. It is clear that more government campaigns are needed. In the absence of this, brands are the key. Consumers need them and follow them, and close examination of what many brands are doing in socially responsible areas shows impressive initiatives. But apart from on websites, few of these brands are telling anyone.

We need advertisers to build social responsibility into corporate and even brand advertising and public relations platforms, to take the message to the people rather than waiting for them to go hunting on websites. We need advertisers to become "Champions for Sustainability".

For this to happen, both clients and agencies need to recognize the potential for brand and product differentiation, and to actively look for opportunities to apply sustainability principles. We also need to create an atmosphere in which they will not feel threatened, or accused of exploitation, if they do so.

In a conducive atmosphere we have a better chance to build sustainable attributes into mass advertising. This will help move social responsibility from being a comforting bit of added value to brands towards a "must have" feature for consumers.

The impact of trade on the environment: main issues and challenges

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Summary
Greater understanding of interactions between trade and the environment is producing fresh approaches to the design of environmental protection instruments and trade instruments. This article reviews theoretical and empirical work on links between trade and environment. It focuses on the environmental effects (positive and negative) of economic globalization and trade liberalization. It also looks at their implications for policies concerning trade and environment.

Résumé
La meilleure compréhension des interactions entre commerce et environnement entraîne un renouvellement des approches dans la conception des instruments de protection de l'environnement et des mécanismes commerciaux. L'article fait le tour des travaux théoriques et empiriques qui étudient les liens entre commerce et environnement. Il examine plus particulièrement les conséquences positives et négatives de la mondialisation de l'économie et de la libéralisation du commerce sur l'environnement. Leur incidence sur les politiques commerciales et environnementales est également abordée.

Resumen
La mejor comprensión de las interacciones entre comercio y medio ambiente esta introduciendo innovaciones en el desarrollo de los instrumentos para la protección ambiental y de los mecanismos de promoción del comercio. El artículo analiza trabajos teóricos y prácticos que investigan las relaciones entre comercio y medio ambiente. En particular, presenta los efectos ambientales (positivos y negativos) resultantes de la globalización económica y de la liberalización del comercio. Finalmente, el artículo aborda las implicaciones que estos dos aspectos pueden tener sobre el comercio y el medio ambiente.

Over the last 50 years global GDP has risen by a factor of six. At the same time, there has been a 14-fold increase in trade. The world economy has become more integrated: growth of world merchandise trade has exceeded the growth of merchandise output almost every year. The volume of world trade in goods grew by an average 7% per year in the 1990s, reaching US$ 6.2 trillion in 2001 (**Figure 1**). This growth has been accompanied by international economic integration and by major changes in the composition and geographical distribution of economic activities.

The globalization of manufacturing in particular is reflected by the strong growth of intra-industry trade, which points to two key aspects of globalization: specialization and exchange based on product differentiation and economies of scale, and production chains extending across national borders.

The huge increase in world trade has been made possible by major advances in transport, communication and information technologies that have substantially reduced the transaction costs of international commerce, stimulating trade directly (by allowing countries to specialize production) and indirectly (by allowing production processes to be located in specialized units around the world). At the same time, the political will to reduce trade barriers has been evident at all levels: at national level, with an explosion of unilateral trade liberalization (often as part of a shift from import substitution to export promotion), at regional level with some 114 regional trade agreements, and internationally through the multilateral trade system, the complex set of trade agreements now managed by the World Trade Organization (WTO).

Most environmental consequences of trade are the result of an expansion of world economic output (scale effects), a reallocation of production and consumption world-wide and between sectors (structural effects), and technological development and diffusion (technology effects). In practice, each economic activity is affected by a combination of these sometimes conflicting effects.

The links between trade and the environment are complex. The positive and negative environmental effects of economic globalization and trade liberalization have major implications for both trade and environmental policies. A growing understanding of these effects, in theory and in practice, is leading to fresh approaches to the design of both environmental protection and trade instruments.

Environmental impact of trade-induced specialization and industrial relocation

A major structural effect of trade is that it induces specialization. According to the theory of comparative advantage, trade allows countries to specialize in the goods and services they produce most efficiently. While standard economic theory acknowledges the economic benefits of trade specialization through increased efficiencies and economies of scale, the environmental benefits are more uncertain.

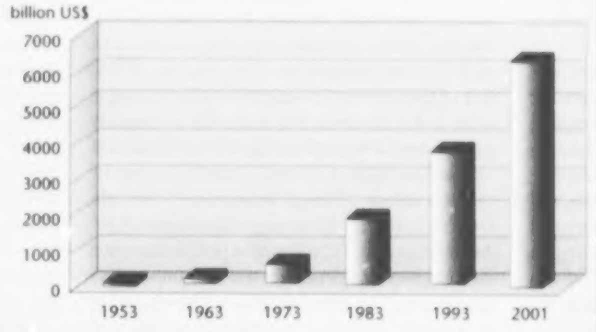
Even assuming that allocative efficiency is optimized, the net effect of trade specialization on the local environment will be positive only if expanding export sectors are less polluting than contracting import sectors. From a regional or global environmental perspective, positive structural effects can result from maximizing allocative efficiency among nations according to environmental carrying capacities and the efficient use of natural resources. For trade specialization to be a move towards environmental sustainability, environmental assets need to be correctly valued and internalized into market prices. Otherwise, consumers will be attracted to underpriced, environmentally harmful products, and firms that specialize in polluting, resource intensive activities will prosper.

The structural effects of trade on the environment can also theoretically lead polluting industries to move from countries that apply stringent environmental controls to "pollution havens" with lower environmental standards and costs. Though the costing of environmental regulation has been completed for only a few countries, empirical evidence points to standards having too small a cost impact on production to provide an incentive for industries to migrate. Many other factors, including political stability, the size of domestic markets, labour costs and ease of repatriation of profits are generally considered more important in location choice.

A recent WTO study[1] reviewed a number of empirical studies and found little evidence that differences in environmental standards affect global trade patterns to any significant degree, though capital, labour and natural resource endowments were major factors. These findings are similar to those of a World Bank study[2] which found that, contrary to common perception, developing countries do not specialize in highly polluting industries. These countries tend to import more pollution-intensive goods than they produce, while the opposite is true for developed countries. Data for the 1980s and 1990s indicate that pollution intensive industrial activity is increasingly located in countries with more stringent environmental regulations, suggesting that the classic comparative advantage factors predominate over the differential environmental standards.

This is explained by the fact that polluting industries (oil refining, chemical industries, pulp and paper manufacturing and primary metals industries) tend to be capital intensive, and that abatement costs, even in countries with the most stringent regulations, represent only a small percentage of production costs. Comparison of developed and developing countries between 1960 and 1990 indicates that any tendency towards the formation of pollution havens was self-limiting. Pollution havens have been as transient as low-wage havens: consumption/production ratios for polluting sector products in the developing world have remained close to unity, suggesting that most polluting sector growth is domestic. At the same time, a significant part of the increase in polluting sector production in developing countries seems due to a highly income-elastic demand for basic industry products: with income growth, this elasticity has declined.

Figure 1
World trade, 1953-2001



Source: International Trade Statistics 2002, WTO

Environmental impact of trade-induced economic growth

Assuming that increased trade fosters economic growth (due to more optimal resource allocation and use), the scale effect of trade on the environment gives rise to the concern that these expanding outputs may exacerbate environmental problems. This concern is central to the arguments of environmental NGOs that oppose economic globalization. Reference is made in this respect to post-war industrialization in OECD countries, as well as more recent export-led economic growth in South-East Asia in the 1980s and early 1990s, when trade-induced growth took place without adequate investment in environmental management. Profits from trade were generally ploughed back into directly productive activities, while environmental regulation and enforcement remained lax, monitoring inadequate and infrastructure (notably waste and water treatment) almost non-existent.

Considerable work has been done on the relationship between economic growth, income levels and environmental quality. While many indicators of environmental quality deteriorate with growth at lower levels of income and then improve, the results vary significantly, with the most localized environmental effects (local water and air pollution) showing the most evident "inverted U" relationship, and others that are more diffuse (e.g. CO_2 emissions) not exhibiting such a relationship at all. The positive effects of income growth on environmental quality tend to be weaker the more "public" is the environmental good. Furthermore, environmental degradation (e.g. climate change) may be irreversible well before the hump in the U-curve has been reached.

A study of 145 countries[3] found that, starting at the lowest level of development, economic development increases environmental policy capacity, the characteristic progression being from natural resource protection through to the regulation of water pollution and air pollution. Nevertheless, though there is evidence that, as incomes rise, economic growth provides the financial resources and willingness to pay for a cleaner environment, this positive effect may not be sufficient to counterbalance the negative environmental impact of trade induced economic growth. Controlling economic growth need not be a requirement for a sustainable society, however, as there is still vast scope for decoupling the relationship between economic growth and environmental impacts through the implementation of sustainable development policies.

Some of the scale effect of trade is attributed to the environmental impact of the transport activities it involves. International trade will result in more long-distance transport than production for domestic markets and will therefore increase both local and international freight flows. International transport is responsible for about one-eighth of world oil consumption, thereby contributing substantially to environmental damage, notably air pollution. In theory, this negative scale effect should be weighed against the overall energy savings derived from more efficient resource allocation world-wide, and compared with the environmental impact of less trade intensive models of development, a task that has yet to be completed. Nevertheless, to the extent that transport costs do not fully capture the environmental externalities involved, the welfare gains from trade are in fact likely to be overstated.

Technology and product effects

Trade can facilitate the diffusion of environmentally beneficial goods and services, thereby contributing to limiting the scale effect of increased trade. This product effect may be enhanced by investment liberalization, assuming foreign investment brings more modern, cleaner technologies. On the other hand, increased trade in dangerous chemicals, hazardous waste, disease bearing pests or endangered species could harm the environment without appropriate controls. Such controls can be exercised through multilateral environmental agreements (MEAs) or through non-discriminatory border measures enforcing domestic regulations and taxes. Technology effects stem from the impact of trade on technology transfers and on the production processes used to make traded goods. They can be positive, as trade induced growth and competitive market pressures can hasten technological modernization and help the introduction of cleaner technologies. On the other hand, increased trade and growing markets may harm environmentally friendly traditional production methods and promote the use of environmentally harmful technologies.

Equilibrium effects: modelling the complexity of trade-environment links

A sector-by-sector analysis of the environmental impact of trade would overlook important interactions between the different economic sectors and countries, so-called "equilibrium effects". The overall environmental impact of increased trade is the combined result of structural, scale, product and technology effects. General equilibrium modelling has attempted to bring these elements together to examine the effects of trade on local and transboundary environmental problems and natural resource use. These models assume that comparative advantages are determined by differences in environmental policies (notably regulations and property rights over natural resources).[4] As a consequence, the most robust result produced is almost definitional: trade will mitigate local pollution problems in countries with a comparative advantage in cleaner industries, and magnify pollution problems elsewhere. Global environmental conditions will deteriorate if differences in environmental standards dominate over classical factors of comparative advantage (capital abundance in developed countries, labour abundance in developing countries).

The validity of these models currently rests on whether differences in environmental protection can reverse the classic pattern of comparative advantage. They are therefore inadequate to allow for the complexity of the relationship between trade and environmental damage. Future models that account for other production factors shaping comparative advantage (such as the distinction between skilled and non-skilled labour) may arrive at different conclusions. Nevertheless, despite their current limitations, general equilibrium models can help explore trade and environment linkages because such linkages are so complex that policy makers relying on intuition alone are not likely to achieve optimality.

Environmental assessments of trade liberalization

Applied models that simulate the environmental effects of trade liberalization have been used to evaluate the economic effects of the Uruguay Round, focusing on whether trade liberalization would generate sufficient economic resources to pay for the cost of improving environmental protection. Other efforts have examined the impact of trade liberalization on the emission of conventional atmospheric pollutants and CO_2.[5] These models have often suffered from inadequate environmental data (notably industry specific emission data), though some country case studies are based on more extensive and reliable data. A study of the impact of the North American Free Trade Agreement (NAFTA) on the Mexican environment shows the composition of the economy changing slightly towards more labour intensive goods that use less polluting inputs between 1990 and 2010. At the same time, because of trade-induced economic activity (particularly the expansion of oil and gas production and energy use), the overall environmental impact is negative for most pollutants. This negative impact could be reversed without giving up much of the economic gain provided market based policies were used to combat the degradation. Other case studies also suggest that trade liberalization without environmental policy measures may dampen or even reverse any positive structural, scale or technology and product effects from increased trade.

A more extreme criticism is that standard economic analysis of the environmental gains of trade is fundamentally flawed because of international factor mobility and imperfect markets, and that in practice international specialization of production and trade flows involve large inefficiencies and environmental costs. Estimates for environmental degradation and natural resource depletion suggest that costs could be as much as 4-5% of GDP per year, compared to efficiency gains from trade liberalization estimated at 1-2% of GDP rising to 3-4% in countries suffering from extreme economic distortions. Failure to take full account of environmental externalities can lead to exaggerated claims of the real gains from trade liberalization.

Table 1
Major MEAs incorporating trade measures

1973	Convention on International Trade in Endangered Species (CITES)
1987	Montreal Protocol on ozone-depleting substances
1989	Basel Convention on hazardous waste
1997	Kyoto Protocol on climate change
1998	Rotterdam Convention on the prior informed consent (PIC) procedure for certain hazardous chemicals and pesticides in international trade
2001	Stockholm Convention on persistent organic pollutants (POPs)

Impact of trade liberalization on environmental policies

The effect of trade liberalization on environmental policies is the key question underlying much of the trade and environment debate. While international competition for investments and jobs can play out in many ways, the particular concern of environmentalists is that governments will sell out their environment in a "race to the bottom". As noted above, there is evidence that environmental regulations are not of primary importance for competitiveness or location decisions. Nevertheless, public concern that trade liberalization will undermine efforts to protect the environment remains because of the "regulatory chill" effect: clear instances of new environmental regulations defeated in the political arena on the grounds that they would harm national competitiveness. Furthermore, trade agreements can affect environmental policies by promoting harmonization of national regulations as a means of trade facilitation, which can result in applying the lowest common denominator. In some cases harmonization has been environmentally beneficial in setting minimum levels of protection that could later be upgraded (for instance, EU emission standards for cars). Nevertheless, trade agreements between countries with differing levels of development and industrialization still pose major regulatory problems. In the case of NAFTA, this issue is being addressed by linking increased market access with funding for environmental policy capacity building.

The positive effect of environmental regulations on international competitiveness has been acknowledged only recently. Environmental regulations lead to innovation and adaptation to deal with the cost implications of regulations. While this adaptation may be costly initially, the argument is that the firms that make this investment gain a comparative advantage from introduced new technologies at an early stage. Examples of this so-called "Porter hypothesis" include DuPont's strategy to be in the forefront of the development of CFC substitutes (which later gave the company an advantage over its competitors) and German industries being forced by regulation to invest in emission control technology and processes, putting them in a strong position when similar regulations were adopted elsewhere in Europe. The Porter hypothesis has been the subject of a great deal of empirical research, mostly supportive. Some leading environmental economists caution against drawing too far-reaching conclusions. While they agree that early estimates of regulatory compliance costs may have been too high because of unforeseen technological or cost saving advances in pollution control, they point to such offsets being quite small.

Trade and environment policy implications

It is widely recognized that trade liberalization can have positive environmental impacts by correcting trade policy intervention failures, notably by removing trade distorting policies which exacerbate environmental problems as well as negative effects related to trade expansion in the absence of environmental protection measures, which may lead to environmental degradation: environmental value may not be fully reflected in the price of traded goods, appropriate pollution control policies or sustainable management practices may not be in place, and environmental and economic policies may be poorly integrated.

For example, agricultural trade liberalization should benefit the environment to the extent that it removes distortive measures such as production supports, export subsidies and quantitative restrictions that have resulted in over-specialization, intensive farming operations and poor land use practices. On the other hand, the expansion of agricultural export markets may lead to greater specialization with environmentally damaging consequences, and increased competition may favour intensive farming operations.

Empirical studies have confirmed the theoretical finding that trade liberalization can harm the local environment in countries with a comparative advantage in polluting industries and improve the local environment elsewhere. At the same time, simulations indicate that the income gains of trade could, in principle, pay for additional abatement costs in order to counter negative environmental effects and still leave a surplus. In other words, by combining trade and environment reforms incomes could rise without compromising environmental quality.

In this sense at least there is no inherent conflict between trade and the environment. Rather, the conflict arises from a failure to address environmental problems, especially those of a global nature that require a concerted effort.

Though there is little evidence of industries responding to higher environmental standards by moving elsewhere, some economic sectors are clearly more affected by environmental regulation. In addition to these specific situations, because political decision-makers tend to behave as though they believe environmental regulation does invariably raise costs, competitiveness concerns are likely to remain an important part of the trade and environment debate. Many observers point to the fact that this debate is built on little or no empirical evidence and that, as a result, competitive concerns can be somewhat overstated. Such concerns, justified or not, have important implications for environmental protection in a free trade context.

The scope of the multilateral trading system is now so wide that it interacts with many areas of public policy, including environmental policy. The perception that efforts to reduce trade barriers threaten the freedom of national governments to pursue stringent environmental policies contributed to the collapse of the 1999 WTO meeting in Seattle. Initiatives to integrate environmental issues with trade policy are still often perceived by the South as originating from and reflecting the economic priorities of the North. (North-South trade has expanded in recent years, but trade between OECD countries still accounts for two-thirds of world trade and five developing countries account for over 60% of developing countries' manufactured goods exports.)

Over the last decade, a series of environment-related trade disputes have drawn attention to the hierarchical and often conflicting relationship between free trade and environmental protection.[6] Nevertheless, the list of WTO members mirrors closely that of the signatories of a range of multilateral environmental agreements. The dismantling of economic borders reinforces the need to cooperate on environmental protection and adopt common approaches and instruments, particularly in the case of transboundary concerns. There are already some 200 MEAs, of which about 20 incorporate trade measures. These include six of the most important agreements (**Table 1**). These agreements restrict trade either because the trade itself is leading to the environmental damage (e.g. CITES) or as an enforcement measure, to ensure that the agreement's objectives are not undermined by non-participation (e.g. the Kyoto Protocol).

Much work is needed to understand how innovative instruments such as carbon emission trading or compensation payments to control tropical forest deforestation can be applied in MEAs. In the absence of any comprehensive framework of global environmental law, the negotiation of further MEAs containing trade measures that can be seen to contravene trade rules will form an increasingly prominent part of the international agenda. The Montreal Protocol, for instance, permits parties to ban imports of chlorofluorocarbons and other controlled substances from non-parties, which breaches the "most favoured nation" and "national treatment" clauses of GATT. It is widely accepted, however, that the inclusion of this measure in the Protocol has contributed significantly to its success and future MEAs may similarly benefit from the inclusion of trade restrictions.

At the WTO ministerial meeting of November 2001, the WTO was for the first time instructed to examine the effect of trade measures in multilateral environmental agreements. Beyond these efforts, there is a broad consensus among proponents and opponents of economic globalization that the integration of trade and environmental policies remains largely the responsibility of national governments rather than supranational organizations. There is also widespread agreement on the need for further knowledge and understanding of the linkages between trade and environment to ensure that trade rules are sustainable in the long term.

Notes

1. Nordstrom, H. and S. Vaughan (1999) *Trade and the Environment.* Special Studies 4, WTO, Geneva.
2. World Bank (1999) *Trade and the Environment: A View from the World Bank.* Washington, D.C.
3. Dasguspta, P.S., A. Mody, S. Roy and D. Wheeler (1995) *Environmental Regulation and Development: A Cross-Country Empirical Analysis.* Policy Research Working Paper No. 1448. World Bank.
4. See, for instance, G. Chilchilnisky (1994) North-South Trade and the Global Environment, *American Economic Review,* September; and B. Copeland and S. Taylor (1994) North-South Trade and the Environment, *Quarterly Journal of Economics,* August.
5. See, for instance, WTO (1995) *Environmental Benefits of Removing Trade Restrictions and Distortions,* Geneva; and M.A. Cole, A.J. Rayner and J.M. Bates (1998) Trade Liberalisation and the Environment: The Case of the Uruguay Round. *World Economy,* Vol. 3, October.
6. See, for instance, the six cases documented by G.P. Sampson (2000). *Trade, the Environment and WTO: The Post-Seattle Agenda,* Policy Essay No. 27, Overseas Development Council, Johns Hopkins University Press, Baltimore, Maryland, USA.

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World News

Current water policy: a threat to global supply

If current trends in water policy and water investment stay the same or become worse, the world will soon experience more environmental damage, threats to global food supply, and increasing health risks for the hundreds of millions of people who lack access to clean water. This is the substance of a report by the International Food Policy Research Institute and the International Water Management Institute, which was made public on World Food Day, 16 October.

"Unless we change policies and priorities, in 20 years there won't be enough water for cities, households, the environment, or growing food," said the lead author of the report, Mark Rosegrant. "Water is not like oil. There is no substitute. If we continue to take it for granted, much of the Earth is going to run short of water or food – or both."

Citing rapid population growth and urbanization in developing countries, among other factors, the report predicts that water use by households, industry and agriculture will increase by at least 50% in the next 20 years. Rising water competition would severely limit the availability of water for irrigation, which in turn would seriously constrain food production.

Joachim von Braun, Director General of the food institute, noted that "Lack of clean water and sanitation is a major cause of disease and child mortality. While world leaders recently agreed at the World Summit on Sustainable Development to cut in half the number of people without access to clean water by 2015, this goal will not become a reality unless governments redirect their water policies to meet the needs of poor people."

The report recommends pricing water to reflect its cost and value, and increasing investment in crop research, technology and rural infrastructure to boost water productivity. Such investment would also increase crop yields from rain-fed farming, which is expected to account for half the increase in food production between 1995 and 2025.

"If countries continue to underinvest in building strong institutions and policies to support water governance and approaches to give better access to water to poor communities," adds Frank Rijsberman, director general of the water institute, "growth rates for crop yields will fall world-wide. ... We need to invest in water conservation, for example, using innovative low-cost, small-scale irrigation technologies – such as a five dollar bucket and drip kit or manually operated treadle pumps – that allow smallholder farmers to irrigate crops using less water, and deliver water to crops when it is needed."

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Climate declaration emphasizes sustainable development

Senior officials from 170 countries met in New Delhi in late October for the eighth Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC). The ministerial declaration they adopted stresses sustainable development and adaptation to climate change.

The Delhi Declaration urges parties to meet all their international commitments under the Convention on Climate Change. It calls for rapid ratification of the Kyoto Protocol and states that parties which have already ratified should strongly urge parties that have not already done so to follow suit as soon as possible.

An earlier draft contained no reference to the Kyoto Protocol. Many countries saw this omission as a sign of US pressure. Another bone of contention during the conference was whether the better-off developing countries should have a larger role in the struggle against global warming. Steady opposition from China, India and other countries finally led the developed countries to drop this demand.

The Delhi Declaration also backs cleaner forms of energy and innovative technology and calls for an increase in technology transfer.

The Kyoto Protocol is expected to enter into force in early 2003 (90 days after its ratification by 55 governments, including those of developed countries representing at least 55% of rich countries' 1990 CO_2 emissions). Poland and the Republic of Korea announced at the conference that they would ratify the Protocol. As of the meeting's close, the 96 parties that had ratified included developed countries accounting for 37.4% of 1990 rich-world emissions. The European Union ratified in mid-summer. Several other countries announced ratification at the World Summit on Sustainable Development.

"Now the spotlight must focus on action to accelerate the transition to climate-friendly economies," said Joke Waller-Hunter, UNFCCC Executive Secretary. "Industrialized countries have only ten years to meet their Kyoto emissions targets – and the evidence today is that most of them still have a great deal of work to do to reduce their greenhouse gases."

For more information contact: UNFCCC Information Services, PO Box 260 124, 53153 Bonn, Germany, Tel: +49 228 815 1005, Fax: +49 228 815 1999, E-mail: secretariat@unfccc.int, Internet: www.unfccc.int.

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Other climate change news:

- The World Bank reports that trading of CO_2 emission credits is expected to have more than tripled world-wide in 2002 compared with 2001. Trading is growing especially active in the European Union – notably UK and Denmark – and Japan. Strong demand in the UK market, for instance, led prices to more than double in the first six months of the voluntary trading system. *(www.prototypecarbonfund.org)*
- New Zealand says its government will impose a carbon tax of as much as NZ$ 25 (US$ 12) per tonne if the Kyoto Protocol comes into force in order to help the country meet its targets. The tax would be levied after 2007, raising retail gasoline prices by up to 6% and those of diesel by 12%. Gas and electricity prices would increase by 8-9%, while coal users' costs would jump 19%. *(www.niwa.co.nz)*
- The United States says its energy-related CO_2 emissions will have fallen by 1.1% by the end of 2002, the first drop in a decade, reflecting the manufacturing slowdown and warm weather. *(www.epa.gov/globalwarming)*
- Zero-emission fuel cell buses will begin operating in 2003 as part of a two-year, EU-backed pilot project involving Amsterdam, Barcelona, Hamburg, London, Madrid, Porto, Reykjavik, Stockholm, Stuttgart and Luxembourg. *(http://europa.eu.int/comm/dgs/energy_transport/index.html)*
- Researchers from Ohio State University say rising CO_2 levels may reduce the amount of protein-building nitrogen in plants. CO_2 helps crops grow and reproduce. However, OSU Professor Peter Curtis says increases in growth and reproduction imply loss of nutritional value as there is "a trade-off between quantity and quality". For the study, reported in *New Phytologist*, researchers ran what Curtis said was the first ever meta-analysis of the effects of climate change on plant reproduction. They summarized data from 159 studies published between 1983 and 2000 *(www.acs.ohio-state.edu/units/research)*
- Colorado State University researchers suggest changes in land use may have even more impact on climate than greenhouse gas emissions. Different land surfaces influence how the sun's energy is distributed back to the atmosphere, explains Roger Pielke, an atmospheric scientist at CSU. Urban sprawl, deforestation and some farming practices, for instance, affect regional surface temperatures, rainfall patterns and atmospheric circulation. *(www.atmos.colostate.edu)*

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IEA foresees plentiful energy but also problems ahead

In a new energy scenario extending to 2030, the International Energy Agency sees supplies holding up but also predicts supply security, investment, environment and poverty problems as well as continued growth in CO_2 emissions. Developing countries are expected to replace the industrialized world as the largest group of energy consumers.

"The world has abundant energy resources for the coming 30 years," says Robert Priddle, Executive Director of the Paris-based IEA. He presented the 2002 *World Energy Outlook* at the International Energy Forum in Osaka. The IEA's flagship publication also presents what he called "formidable challenges", including the fact that no end to the "energy poverty" of a large proportion of the world population is in sight. "Despite serious efforts by many countries, energy-related carbon dioxide emissions, which threaten to change the earth's climate decisively, continue to grow."

The *Outlook*, which is published every two years, projects trends in energy supply and demand, prices, trade and carbon emissions. These projections are widely seen as authoritative. In the 2002 version its projection horizon has been extended from 2020 to 2030, a chapter on "Energy and Poverty" and an in-depth study of China have been added, and there is an Alternative Policy Scenario projecting the results of adoption by OECD countries of all energy efficiency and climate-friendly policies and measures now under discussion.

The Reference Scenario (business as usual) shows fossil fuels remaining the dominant source of energy, nuclear power use declining, renewable energy forms responsible for a rising share of power generation, energy trade expanding very rapidly, and oil and gas production increasingly concentrated in a few countries.

In the Alternative Policy Scenario, OECD countries cut carbon emissions, particularly by using renewables in electricity generation, but meeting the Kyoto targets will still not be easy and energy poverty will persist.

For more information, contact: Fiona Davies, International Energy Agency, 9 rue de la Fédération, 75739 Paris Cedex 15, France, Tel: 33 1 40 57 65 50, Fax: 33 1 40 57 65 59, E-mail: fiona.davies @iea.org, Internet: www.iea.org.

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EU ratification raises Cartagena Protocol hopes

The European Union has ratified the Cartagena Protocol, raising hopes that the agreement will come into force in 2003. The EU Environment Council has also reached a political agreement on the cross-border movement of genetically modified organisms (GMOs).

The Cartagena Protocol, which provides a framework for international trade in GMOs by assuring their safe transfer, handling and use, was adopted in January 2000 and must be ratified by 50 countries to come into force. By mid-October, when the Environment Council met, indications were that enough countries would ratify by the end of 2002 for the Protocol to come into force in 2003.

For more information, contact: Nick Nuttall, Head of UNEP Media, Tel: +254 2 623 084, Mobile: +254 733 632 755, E-mail: nick.nuttall@unep. org.

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High mercury levels detected by Arctic monitoring

Toxins in the food chain, especially mercury, are threatening humans and wildlife in the far north, according to the Arctic Monitoring and Assessment Programme's second assessment of the arctic environment. The problems it reports include high blood pressure in newborn babies, and low fertility and infant mortality in polar bears.

Arctic Pollution 2002 says the amount of mercury detected was "much higher than anyone believed before," with effects as far south as the Faeroe Islands (62° north). The report notes that mercury emissions, largely from coal power plants and waste incinerators, are increasing in China and elsewhere in Asia.

This report was the focus of AMAP's second International Symposium on Environmental Pollution in the Arctic, held in Finland in October. (Also see report from the UNEP experts' meeting on mercury, page 103).

For more information, contact: AMAP Secretariat, Stromsveien 96, PO Box 8100 Dep., N-0032 Oslo, Norway, Tel: +47 22 57 34 00, Fax: +47 22 67 67 06, E-mail: amap@amap.no, Internet: www.amap.no.

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Related news:

◆ The European Parliament and European Council have agreed on proposals to introduce mandatory collection, reuse and recycling of waste electrical and electronic equipment and to restrict the use of mercury and other hazardous substances in new equipment. Manufacturers will have to pay for the recycling. Such equipment is the fastest growing part of the waste stream in Europe (amounting on average to 14 kg per person per year) and 90% of it is landfilled or incinerated without pretreatment. (*http://europa.eu.int/comm/environment/docum/00347_en.htm*)

◆ The United States Environmental Protection Agency (EPA) has proposed changing its waste regulations for computers, televisions and other mercury-containing equipment to discourage landfilling and incineration of such material and to promote its safe reuse and recycling. (*www.epa.gov/ebtpages/wastes.html*)

◆ The EPA also says more than one-fourth of US lakes are on state warning lists for fish contaminated with mercury, dioxins and other hazardous substances. Almost 75% of these state advisories concern mercury contamination. (*www.epa.gov/waterscience/fish*)

◆ In separate studies reported by several sources, researchers in Hong Kong found that higher than normal blood levels of mercury are linked to infertility, and that as many as 10% of high school stu-

Warnings and disputes on Asian Brown Haze

A blanket of pollution across South Asia three kilometres deep is damaging agriculture, modifying rainfall patterns and putting hundreds of thousands of people at risk, according to scientists working with UNEP. They also warned that economic growth in the region could falter because of the "Asian Brown Haze."

Preliminary observations gathered by 200 scientists working on the Indian Ocean Experiment (INDOEX), supplemented by new satellite readings and computer modelling, indicate that the mass of ash, acids, aerosols and other particles is disrupting weather systems. There are concerns that the regional and global impact of the haze will intensify as the population of Asia rises.

Klaus Toepfer, Executive Director of UNEP, said when the assessment report was launched: "The haze is the result of forest fires, the burning of agricultural wastes, dramatic increases in the burning of fossil fuels in vehicles, industries and power stations and emissions from millions of inefficient cookers burning wood, cow dung and other 'bio fuels'." He added that such a "pollution parcel" could "travel halfway round the globe in a week."

While this study focused on South Asia, the haze problem is comparable, if not more severe, in South-East and East Asia. The scientists called for an action plan to address the threats across Asia as a whole.

Many Indian scientists, and some in the US, disputed certain of the findings, especially regarding the geographic sources of the pollution and whether the haze is a new phenomenon. A month later, however, NASA's Goddard Institute appeared to lend support to the report with a climate study finding that large amounts of soot and other pollutants were causing changes in precipitation and temperatures over China, and that they could be at least partly responsible for increased floods and droughts in the last several decades.

For more information, contact Nick Nuttall (see above) or Internet: www.rrcap.unep.org/abc/impactstudy; and Goddard Newsroom, Ed Campion, Tel: +1 301 286 8955, Fax: +1 301 286 1707, E-mail: edward.s.campion.1@gsfc.nasa. gov, Internet: www.gsfc.nasa.gov/topstory/20020822blackcarbon.html.

dents are ingesting too much mercury because their diet is high in predatory fish such as shark, tuna and swordfish, which tend to contain higher concentrations.

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Study cites gaps in US environmental data

A study by some 150 experts for the Heinz Center for Science, Economics and the Environment criticizes what it calls major gaps in data about US land, water and living resources. It proposes periodic reporting of key indicators.

William Clark, professor at Harvard University's John F. Kennedy School of Government, who chaired the project, said: "Just as economic policies are informed through a set of key indicators such as gross domestic product, inflation, unemployment, and the balance of trade, we as a nation must have clear indicators of the condition of our ecosystems as a basis for shaping public policies and private sector initiatives."

The report proposes ten indicators: ecosystem extent; fragmentation and landscape pattern; building blocks of life; contaminants; physical conditions; plants and animals; biological communities; plant growth and productivity; production of food and fibre and use of water; and recreation and other services.

For more information, contact: Robin O'Malley, The H. John Heinz III Center for Science, Economics and the Environment, 1001 Pennsylvania Ave, NW, Suite 735 South, Washington, DC 20004, USA, Tel: +1 202 737 6307, Fax: +1 202 737 6410, E-mail: omalley@heinzctr.org, Internet: www.heinzctr.org.

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Industry Updates

Chemical regulations faulted in US study

A two-year study in the United States reveals serious deficiencies in federal regulations designed to prevent chemical fires, explosions, toxic gas emissions and other accidents involving reactive properties, the US Chemical Safety and Hazard Investigation Board (CSB) says.

In *Hazard Investigation: Improving Reactive Hazard Management*, the CSB analyzes 167 incidents of "uncontrolled chemical reactivity" from January 1980 to June 2001. More than half involved chemicals not covered by existing process safety regulations. The incidents, involving substances in more than 40 chemical classes, caused an average of six injuries and five deaths per year.

Though considerable information on chemical reactivity is available, the CSB said, the industry is not using the information enough.

For more information, contact: CSB Office of External Relations, 2175 K Street, NW, Suite 400, Washington, DC 20037-1809, USA, Tel: +1 202 261 7600, E-mail: info@csb.gov, Internet: www.chemsafety.gov.

◆

Dell to recycle all home computers

The computer maker Dell is letting US home computer users recycle desktop and notebook computers from any manufacturer through a new programme called Dell Exchange. Participants get shipping instructions on line, pay the shipping charges to the nearest recycling centre, then receive a certificate – also on line – indicating the process is complete.

The recycled computers are separated into components – primarily plastic, metal and glass – of which nearly 98% are reused, the company said. Dell has offered US business customers take-back services since 1991 and estimates it has recovered more than 2 million computers world-wide in that time.

For more information, contact: Dell Computer Corporation, One Dell Way, Round Rock, Texas 78682, USA, Internet: www.dellexchange.com.

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Negative effects of high-tech operations in developing countries

Despite voluntary efforts, semiconductor companies' production and assembly operations continue to have many negative environmental and social effects, especially in developing countries, the Nautilus Institute for Security and Sustainable Development reports.

Citing case studies from Taiwan, Malaysia, India, Thailand and Costa Rica, the think tank reported that the main problems were hazardous materials used in production and assembly and contained in the products; high water and energy intensity; inadequate protection of workers' health and labour rights; and poor oversight by global supply chains. The report focused particularly on overseas operations of California-based high-tech companies.

The Nautilus Institute, which aims to use "strategic tools of cooperative engagement to solve fundamental problems undermining global security and sustainability," produced the report as part of its California Global Corporate Accountability Project.

For more information, contact: Lyuba Zarsky, Nautilus Institute, 125 University Ave., Berkeley, CA 94710-1616 USA, Tel: +1 510 295 6100, Fax: +1 510 295 6130, E-mail: lzarsky@nautilus.org, Internet: www.nautilus.org.

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Putting coal mine methane to good use

At a former coal mine in West Yorkshire, the UK energy group Alkane has started turning polluting methane gas into electricity.

Wheldale Green Energy Park opened in October next to a mine that was closed in 1987 and had been emitting methane ever since. Alkane engineered a seal that allows the mine to capture the gas for on-site power generation. The site, with capacity of 10.6 MW, produces enough electricity to supply 8000 homes, and is expected to reduce methane emissions from the mine by 85%.

The UK Department of Trade and Industry says that more than 1000 abandoned coal mines dot the country and that estimates suggest they are leaking as much as 13.8 million tonnes a year of greenhouse gases. Coal mine methane has 23 times the global warming potential of CO_2, Alkane noted.

For more information, contact: Alkane plc, Edwinstowe House, High Street, Edwinstowe, Nottinghamshire NG21 9PR, UK, Tel: +44 1623 827927, Fax: +44 1623 827930, E-mail: info@alkane.co.uk, Internet: www.alkane.co.uk.

Red Cross Red Crescent to work with UNEP on natural disasters in Africa

The International Federation of Red Cross and Red Crescent Societies has joined forces with UNEP to reduce the impact of natural disasters on the lives of Africans. The two bodies signed a memorandum of understanding on a three-year, US$ .7 million project to help local and national experts review current policies and early warning systems in ten countries. The project will also result in seasonal emergency contingency plans based on vulnerability studies.

"Environmental degradation is a major factor in the acute food crisis currently being faced by over 20 million people across the African continent," said Didier Cherpitel, secretary-general of the International Federation, which has 53 national Red Cross and Red Crescent member societies in Africa. The countries involved in the initiative are Algeria, Ethiopia, Kenya, Mozambique, Niger, Nigeria, Senegal, Sudan, Zambia and Zimbabwe.

"Specific initiatives and interventions developed so far, mainly at national level, have not always been able to reverse the impact of natural disasters in Africa," commented UNEP Executive Director Klaus Toepfer. "It is high time to unite our efforts and provide understanding through increased awareness of risks associated with floods and drought."

For more information, contact: Roy Probert, Information Officer, International Federation of Red Cross and Red Crescent Societies, PO Box 372, CH-1211, Geneva 19, Switzerland, Tel: +41 22 730 4296, Mobile: +41 79 217 3386, Fax: +41 22 733 0395, Internet: www.ifrc.org.

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UNEP rainwater project helps Kenyan women

Masai women have joined a pioneering initiative that promises to dramatically reduce the time they spend finding and collecting clean water. "Empowering Women in Rainwater Harvesting in Kenya," in which rainwater is harvested using special low-cost containers and mini-reservoirs, allows women to collect unpolluted water on their doorsteps rather than trekking for miles.

EarthCare Africa developed the project on behalf of UNEP and then handed over the rainwater harvesting facilities to women of the Masai pastoralist group. Similar facilities were developed earlier at another rural Kenya location and one site in Nairobi, the capital. So far the three locations' total capacity is over 520,000 litres of harvested rainwater.

The project is part of an international initiative, funded by Sweden, that includes similar facilities developed or under way in Nepal, India and Bhutan and on the Pacific island of Tonga. The two-year project in Kenya has received US$ 110,000 in Swedish funding.

For more information, contact: Angele Luh, UNEP Regional Information Officer for Africa, PO Box 30552, Nairobi, Kenya, Tel: +254 2 624294, Fax: +254 2 623928, E-Mail: angele.luh@ unep.org.

◆

A new UN day: protecting the environment from war

The United Nations observed 6 November 2002 as the first International Day for Preventing the Exploitation of the Environment in War and Armed Conflict.

Calling the environment "the unpublicized victim of war," the international body noted that such environmental damage – for example, polluted air, water and land, unregulated plunder of natural resources and the impact of mass population movements on water, biodiversity and ecosystems – is often reversible only in the long term.

In 1999, UN Member States requested UNEP and its sister agency, UN-Habitat, to establish a Balkans Task Force to analyze how military actions in the Balkans had affected the environment and human settlements. Since then UNEP has participated in several monitoring and assessment missions and projects. The task force, renamed the Balkans Unit and later the Post-Conflict Assessment Unit, is now a permanent part of UNEP's Division for Environmental Policy Implementation and has a global mandate.

Among the unit's missions have been:

- environmental clean-up feasibility studies in Serbia;
- visits to Albania and Macedonia to assess the environmental damage caused by the Kosovo conflict;
- analysis of the environmental impact of refugees in Guinea;
- a visit to Afghanistan to pinpoint areas where environmental degradation has occurred and to determine where a more in-depth assessment is needed.

Environmental consequences identified by UNEP missions include pollution and other damage such as oil spills and chemical leaks from bombing of factories, oil refineries and storage facilities; deliberate acts of environmental sabotage such as the draining of Mesopotamian wetlands, the torching of Kuwaiti oilfields and widespread use of defoliants; destruction of habitats (the gorilla population of Kahuzi Biega destroyed through unregulated coltan extraction); and the ruin of arable land by landmines, unexploded munitions and other debris of war.

For more information, contact: Nick Nuttall, UNEP Head of Media (see above).

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Wastewater targets for threat to coasts

UNEP has called on governments to back wastewater emission targets after a report by UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA), prepared in response to a target on sanitation agreed at the World Summit on Sustainable Development, detailed threats to coastal populations and the environment from untreated sewage discharges.

The report says the coastal habitats, fisheries, marine wildlife and the people of the Asian, North West Pacific and West African sea regions were the most threatened from untreated discharges into coastal waters. The WSSD target is to halve the number of people without access to basic sanitation by 2015. Almost 40% of the world population lives less than 60 kilometres from the ocean shore.

The report also points out that many developing countries have increased levels of sanitation coverage and wastewater treatment services, but these are being overwhelmed by population growth.

Klaus Toepfer, UNEP's Executive Director, said efforts to deal with the problem should include "realistic but ambitious wastewater emission targets" like those for toxic chemical discharges from factories and air pollution from power plants.

For more information, contact: Cees van de Guchte, UNEP/GPA Coordination Office, PO Box 16227, 2500 BE, The Hague, The Netherlands, Tel: +31 70 311 4464, Fax: +31 70 345 6648, E-mail: cvandeguchte@unep.nl, Internet: www.gpa.unep.org.

◆

World's top judges propose environmental action plan

More than 100 of the world's most senior judges, meeting in Johannesburg right before the World Summit on Sustainable Development, drew up an action plan to strengthen the development, use and enforcement of environment-related laws, a move seen as vital for efforts to deliver sustainable development.

The Johannesburg Principles on the Role of Law and Sustainable Development were adopted at the Global Judges Symposium, organized by UNEP, and delivered to UN Secretary-General Kofi Annan at the summit.

The High Court and Supreme Court judges said two keys to improve the adoption and implementation of environment-related laws were increasing training, education, funding and capacity building for legal experts, particularly in developing nations, and giving the public more access to public information on environment- and development-related issues as well as access to the legal system.

In many developing countries and independent states formerly part of the Soviet Union, it is hard for environmental cases to succeed in (or even reach) the courts owing to lack of resources, difficulties in turning international treaties into national law, and lack of awareness if not apathy as a result of economic hardship.

"This is an issue affecting billions of people who are effectively being denied their rights," said Klaus Toepfer, Executive Director of UNEP. Justice Arthur Chaskalson, Chief Justice of South Africa, who co-hosted the symposium, concluded: "Our declaration and proposed programme of work are, I believe, a crucial development in the quest to deliver development that respects people and that respects the planet for current and future generations and for all living things."

For more information, contact: Nick Nuttall (see above).

◆

First meeting of Dams and Development Forum

The Dams and Development Forum, part of UNEP's recently established Dams and Development Project (DDP), has met for the first time and discussed drawing up a DDP work programme and developing guidelines for the forum's steering committee. The event in Nairobi brought together some 80 representatives of governments, affected populations, indigenous peoples, utilities, NGOs, the private sector, finance institutions, professional associations, researchers, and groups working on alternatives to dams.

UNEP set up the DDP in 2001 to promote dialogue on improving decision making, planning and management of dams and their alternatives. It is a follow-up to the November 2000 report by the World Commission on Dams, in which 12 independent experts from all sides of the dams debate gave their views.

For more information, contact: UNEP Dams and Development Project, PO Box 16002 Vlaeberg, Cape Town 8018, South Africa, Tel: +27 21 426 4000, Fax: +27 21 426 0036, E-mail: info@unep-dams.org, Internet: www.unep-dams.org; or Nick Nuttall (see above).

◆

Canada and Norway increase UNEP funding

Canada has more than doubled its contribution to UNEP, and Norway has donated around US$ 2 million for a new United Nations University branch hosted at the UNEP GRID-Arendal centre.

Canada said that its UNEP funding would rise by $5.7 million over four years to influence environmental governance, and that it would increase its support for UNEP's Global Environment Monitoring System Water Program in Burlington, Ontario, by $1.5 million over three years.

The Norwegian Ministry of Foreign Affairs said its donation of NOK 15 million would support the new Global Virtual University in a partnership involving GRID-Arendal, Agder University College and the UNU. The GVU will offer on-line, decentralized studies via courseware to be developed by a global network of academic institutions, with a focus on the developing countries.

For further information, contact: Suzanne Meunier, Environment Canada, +1 819 953 4016; and Deputy Director Harald Holt, UNEP/GRID-Arendal, Tel: +47 3703 5701, E-mail: holt@grida.no, Internet: www.grida.no.

◆

New Sustainability Reporting Guidelines from GRI

The Global Reporting Initiative (GRI), a UNEP Collaborating Centre based in Amsterdam, has launched the 2002 version of its Sustainability Reporting Guidelines. The aim of the guidelines is to help companies and organizations prepare comparable "triple bottom line" reports (on economic, environmental and social performance). The new version is available in paper form or can be downloaded at no charge from the GRI Web site (see below).

For more information, contact: Global Reporting Initiative, Keizersgracht 209, PO Box 10039, 1001 EA Amsterdam, The Netherlands, Tel: +31 20 531 00 00, Fax: +31 20 531 00 31, E-mail: info@globalreporting.org, Internet: www.globalreporting.org.

32 countries give GEF its greatest replenishment ever

The Global Environment Facility (GEF) has received pledges from 32 donor governments for a US$ 2.92 billion replenishment for 2002-06 – the highest ever for the fund, which in the past ten years has committed more than US$ 4 billion and mobilized some US$ 11 billion for more than 1000 projects in 160 countries.

Thanks to the GEF, set up in 1991 to help developing countries fund projects and programmes that protect the global environment, countries have been able to work on the impacts of global warming, conserving wildlife, monitoring and improving the health of international waters and overcoming land degradation, among other projects. UNEP runs a portfolio of GEF projects and other activities valued at about US$ 500 million.

In October the GEF Assembly voted in Beijing to add land degradation and persistent organic pollutants as focal areas.

Mohamed T. El-Ashry, the fund's founding chairman, recently announced that he would leave the GEF at the conclusion of his third term in July 2003

For more information, contact: Hutton G. Archer, External Relations, Global Environment Facility Secretariat, 1818 H Street NW, Washington, DC 20433, USA, Tel: +1 202 458 7117, Fax: +1 202 522 3240, E-mail: harcher@worldbank.org, Internet: http://gefweb.org.

◆

Business partnerships honoured, new partnerships with UNEP DTIE announced

UNEP and the International Chamber of Commerce (ICC) held a ceremony in Johannesburg to honor ten business partnerships for their contributions to sustainable development. Winners of the World Summit Business Awards for Sustainable Development came from four continents and represented innovative projects involving companies, environmental groups, local communities and governments.

The lead partners of the ten projects were:

- Alcan Inc. (Canada) for a school-based recycling programme in Brazil, Canada, Malaysia, Thailand and the US;
- Shell (Philippines) for a gas exploration project;
- Axel Springer Verlag (Germany) for promoting greater accountability in newsprint production;
- Kesko (Finland) for reducing packaging waste in retail stores;
- E7 Network of power generation companies (several countries) for a project providing renewable electricity to Indonesian villages;
- ForesTrade (USA) for building up an international market in organic spices grown in Indonesia and Guatemala;
- Municipality of Calvia (Spain) for working with local hotels to reduce waste from the tourism industry;
- BioRe and Coop (Switzerland) for building up a market in organic cotton clothing involving farmers in India and Tanzania;
- Migros (Switzerland) for promoting sustainable production of palm oil in Ghana for its consumer products;
- Business Trust South Africa (a coalition of South African companies and local government) for an initiative to build the tourism industry and create jobs.

In addition, UNEP DTIE is lead partner in several partnerships announced at the summit, including:

- Capacity Building for Sustainable Consumption and Production Patterns (with contributions from UNIDO and UNESCO, and with Consumers International as key partner), aiming to improve decision makers' abilities to implement sustainable consumption and production policies;
- Capacity Building Task Force on Trade, Environment and Development – 2nd phase (co-led by UNCTAD, in close liaison with the WTO), aiming to enhance developing countries' human

and institutional capacities for dealing with issues arising from the relationship between trade liberalization, environmental protection and economic development;

- an integrated approach to prevention, preparedness for and response to environmental emergencies in support of sustainable development (co-led by the Office for the Co-ordination of Humanitarian Affairs), aiming to advance integrated approaches to environmental emergencies so as to ensure that all aspects of emergency management, including risk reduction and emergency prevention, are properly and systematically addressed.
- The Global Network on Energy for Sustainable Development (see the following article).

For more information, contact: (awards) Bryce Corbett, Director of Communications, International Chamber of Commerce, 38 Cours Albert 1er, 75008 Paris, France, Tel: +33 1 49 53 28 22, Fax: +33 1 49 53 29 24, E-mail: bryce.corbett@iccwbo.org, Internet: www.iccwbo.org; (UNEP DTIE partnerships) Janet Hallows, Division Office, UNEP DTIE (see address above), Tel: +33 1 44 37 14 69, Fax: +33 1 44 37 14 74, E-mail: janet.hallows@unep.fr, Internet: www.uneptie.org/outreach/wssd.

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WSSD

"Workmanlike" agreements on water, chemicals, energy

The World Summit on Sustainable Development (WSSD), held in Johannesburg in late August and early September, ended with agreements that Klaus Toepfer, Executive Director of UNEP, described as satisfactory and "workmanlike".

"At various moments during [the summit] we were facing a much weaker prospect for the environment and thus for sustainable development," Mr. Toepfer said. "I am satisfied that what has been delivered is a step forward."

During the summit Mr. Toepfer served as a special adviser to UN Secretary-General Kofi Annan, who said at the event's conclusion: "This summit will put us on a path that reduces poverty while protecting the environment, a path that works for all peoples, rich and poor, today and tomorrow. ... Governments have agreed here on an impressive range of concrete commitments and action that will make a real difference for people in all regions of the world."

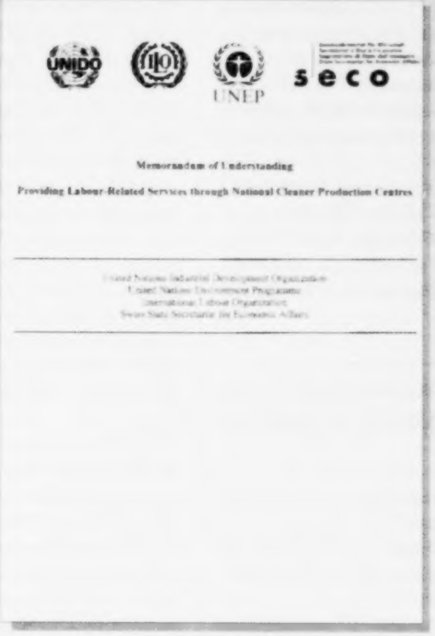
The major agreement resulting from WSSD, the Plan of Implementation, contains targets and timetables on issues ranging from halving the proportion of people who lack access to clean water or proper sanitation by 2015 and restoring depleted fisheries by 2015 to reducing biodiversity loss by 2010 and using and producing chemicals in ways that do not harm human health and the environment by 2020. Governments also accepted the need for a new international approach to chemical management and the harmonization of labelling and classification of chemicals by 2008.

Countries pledged for the first time to increase the use of renewable energy, though only "with a sense of urgency" rather than with a target and timetable. The summit also generated concrete partnerships by and between governments, citizen groups and businesses in areas such as corporate responsibility and environmental standards.

Other achievements that Mr. Toepfer listed were the development of a ten-year programme for sustainable consumption and production patterns, "based on science-based approaches and life-cycle analysis," and a new initiative to encourage industry to improve its social and environmental performance, taking into account ISO standards and the Global Reporting Initiative.

Mr. Toepfer noted that the context of the 1992 Rio summit was "the fall of the Berlin Wall and the end of the Cold War," whereas "today we have a new realism as a result of globalization. So the action plan agreed here in Johannesburg is less visionary and more workmanlike, reflecting perhaps the feeling among many nations that they no longer want to promise the Earth and fail, that they would rather step forward than run too fast."

For more information, contact: Eric Falt, UNEP Spokesperson and Director, Division of Communications and Public Information, Tel: +254 2 623292, E-mail: eric.falt@unep.org.



UNIDO
ILO
UNEP
seco

Memorandum of Understanding

Providing Labour-Related Services through National Cleaner Production Centres

United Nations Industrial Development Organization
United Nations Environment Programme
International Labour Organization
Swiss State Secretariat for Economic Affairs

Under this Memorandum of Understanding, the ILO will introduce, in cooperation with a variety of other partners, including local employers' organizations, UNIDO, UNEP and donors, labour related services through the NCPCs. The Swiss Government will provide pilot phase support. The introduction of labour services through the NCPC network will target awarenesss-raising, training, technical assistance and policy advice to enterprises, in support of the ILO's core labour standards as well as national labour legislation.

Energy Day: discussions, partnerships and a new network

UNEP, the International Energy Agency and the South African electric utility Eskom conducted a daylong side event at the summit on energy for sustainable development. Sessions dealt with energy security, energy access and energy and the environment, and potential partnership initiatives were presented. The day culminated in a panel discussion involving ministers, CEOs and heads of intergovernmental and non-governmental organizations.

In addition, UNEP launched a global network of "sustainable energy" centres at the summit. The Global Network on Energy for Sustainable Development, made up initially of ten centres in ten developed and developing countries, will help promote the research, transfer and take-up of green and cleaner energy technologies for the developing world, where more than 2 billion people lack access to reliable forms of energy.

The new network, which is a partnership, will strengthen collaboration between existing "centres of excellence" that work on energy, development and environment issues, and, through these centres, influence sustainable energy policies, strategies and programmes. UNEP will host a small secretariat for the network while a steering committee representing the energy centres and other partners will provide strategic direction.

Core partners include the Tata Energy Reseach Institute (India), the African Energy Policy Research Network (Kenya), the Bariloche Foundation (Argentina), ENDA Tiers Monde (Senegal) and the Energy Research and Development Centre (South Africa). Other partners include international organizations, governments, financial institutions, private-sector representatives and foundations.

UNEP developed the network in cooperation with the UNDP, UNIDO, UN DESA and the World Bank, drawing on input from the energy centres. Initial funding comes from the governments of Germany, France, the United Kingdom and Denmark, and the UN Foundation.

Also at the summit, UNEP and the United Nations Foundation released a report on the Rural Energy Enterprise Development (REED) initiative, which is bringing affordable, clean, efficient energy technology to rural communities in Africa, Brazil and China. *Open for Business: Entrepreneurs, Clean Energy and Sustainable Development* describes how the REED programmes work locally to provide business development services, helping entrepreneurs start companies offering energy-efficient cookers, wind-pump repair services, supply and service of solar home systems, energy efficiency services and the like. REED is a US$ 8.6 million partnership of the foundation, UNEP and a US non-profit clean energy investor, E+Co.

For more information, contact: Mark Radka, Energy Unit, UNEP DTIE, Tour Mirabeau, 39-43 quai André-Citroen, 75739 Paris, France. Tel: +33 1 44 37 14 27, Fax: +33 1 44 37 14 74, E-mail: mark.radka@unep.fr, Internet: www.uneptie.org/energy.

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Summit side events: industry, trade, finance

Among the many events going on before and during the summit were several concerned with industry, trade and related areas, especially the finance industry and sustainable-development financing.

These included the launch of the publication *Financing for Sustainable Development* by UNEP, the World Bank and the International Monetary Fund (see book review, page 105); presentations by the UNEP Finance Initiatives on "A new Asia & Europe strategy for enhanced partnership" and "Finance, sustainability and Africa"; and a panel event on activities of the finance community related to sustainability.

In addition, the UNEP/UNESCO YouthXchange programme launched a partnership with Yomag, an on-line magazine for young consumers; and UNEP's Economy and Trade branch held an event on "Capacity Building in Trade and Sustainable Development" to showcase programmes and projects helping governments in developing countries identify and respond to links between trade, environment and development.

For more information, see www.uneptie.org/outreach/wssd/contributions/events.htm.

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UNEP Division of Technology, Industry and Economics (DTIE) HIGHLIGHTS

A big bill for climate change

Members of the UNEP Finance Initiatives (FI) warn that too few banks, pension funds and insurance companies are taking seriously the risks and opportunities posed by climate change, and they estimate that the bill for natural disasters in 2002 could be over US$ 70 billion.

In findings published in early October and formally presented at the latest climate change talks in New Delhi towards the end of that month, the UNEP FI members state: "The increasing frequency of severe climatic events ... has the potential to stress insurers, reinsurers and banks to the point of impaired viability or even insolvency."

Climate Change and the Financial Services Industry (see book review, page 108) says losses as a result of natural disasters appear to be doubling every decade and have totalled US$ 1 trillion over the past 15 years. Annual losses in the next ten years will reach close to $150 billion if current trends continue.

Munich Re, an FI member that has been compiling annual records on natural catastrophes and their costs since the 1970s, told the eighth Conference of the Parties to the United Nations Framework Convention on Climate Change in New Delhi that such catastrophes – mostly weather related – cost countries and communities some US$ 56 billion from January through September 2002 and thus could reach over US$ 70 billion for the year.

The Finance Initiatives constitute a partnership between UNEP and 295 banks, insurance and investment companies. The report from the FI Climate Change Working Group warns that climate change-driven natural disasters could wreak havoc in the world's stock markets and financial centres, with the property market being deemed particularly vulnerable. Asset managers (e.g. pension funds) that are slow to appreciate the climate change threat may see the value of power company and other energy holdings decline as investors become more aware of the liabilities linked with carbon-intensive industries, the report finds.

Yet it adds that opportunities are emerging that should allow the financial services sector to reduce or hedge against the risks and even help curb emissions of the greenhouse gases linked with the destabilization of the Earth's climate and weather systems. The annual market in trading greenhouse gases, emerging as a result of international agreements to reduce emissions, could be worth as much as US$ 2 trillion by 2012, it notes, and the market for clean energy could stand at US$ 1.9 trillion in 2020, by some estimates.

A survey of mainstream financial institutions carried out for the report indicates that most are unaware of the climate change issue or, largely because of uncertainty over the fate of the Kyoto Protocol, have adopted a "wait and see" attitude.

For more information, contact: Ken Maguire, UNEP Finance Initiatives, International Environment House, 15 Chemin des Anémones, CH-1219 Châtelaine, Geneva, Switzerland. Tel: +41 22 917 8178/8116, Fax: +41 22 976 9240, E-mail: maguirek@unep.ch, Internet: www.unepfi.net.

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Ozone Day marked by cautiously hopeful report

A new report by the world's leading ozone scientists warns that, despite good signs of recovery, the ozone layer will remain particularly vulnerable during the next decade or so even if countries comply with international agreements to protect it.

An excerpt from the UN Secretary-General's Ozone Day statement

The success achieved so far in reducing the production and consumption of ozone-depleting substances in industrial countries should give us hope that we will complete this task in developed and developing countries alike.

I urge all countries to meet their commitments under the [Montreal] Protocol, and in particular the industrialized countries to continue providing the financial and other assistance that will help the developing countries to do so.

This year's observance of the International Day for the Preservation of the Ozone Layer falls immediately after the World Summit on Sustainable Development. As the world now turns to implementing the agreements reached in Johannesburg, let us not lose sight of the need to remain vigilant in protecting the ozone layer.

Kofi A. Annan

New data in the report from UNEP and World Meteorological Organization (WMO) show that levels of ozone-depleting gases in the upper atmosphere are at or near their peak. Thus, the scientists believe, human-influenced disturbances to Earth's protective shield are "at or near their largest," and the report clearly shows steady progress towards recovery of the ozone layer, with the amount of ozone depleting chemicals lower atmosphere continuing to decline, if slowly.

Presenting the executive summary of the report in Paris on the International Day for the Preservation of the Ozone Layer (16 September), Professor Gérard Mégie, co-chair of the Montreal Protocol's Scientific Assessment Panel and one of the report's authors, said: "These results confirm that the Montreal Protocol is achieving its objectives. During the next decades, we should see a recovery of the ozone layer."

Experts said the findings underline the need for strengthened political commitment to assure continued compliance with the Montreal Protocol by developed and developing countries alike, along with a need for greater awareness of the reasons for the ozone layer's vulnerability and improved scientific understanding of the links between ozone layer depletion and climate change.

Scientific Assessment of Ozone Depletion: 2002 involved 250 scientists from 37 countries. It focuses on scientific results since 1998 but also has a section on implications for policy formulation. The concern expressed in the report stems from two main findings: first, that failure meet Montreal Protocol targets would delay or perhaps even prevent recovery of the ozone layer; and, second, the number of scientific unknowns relating to issues like the complex link between ozone protection and climate change.

Professor Mégie, who is also the President of the French Centre National de la Recherche Scientifique, noted that the concentration of chlorine, the main ozone-depleting substance, in the upper atmosphere "has now reached a maximum and the ozone layer is still quite vulnerable."

The Montreal Protocol has been ratified by 183 countries. The executive summary of the assessment report was presented to the parties to the Montreal Protocol at a meeting in Rome in late November and the full report is to be made available in 2003.

For more information, contact: Rajendra Shende, Chief of Energy and OzonAction Unit, UNEP DTIE (see address above), Tel: +33 1 44 37 14 59, Fax: +33 1 44 37 14 74, E-mail: rmshende@unep.fr, Internet: www.uneptie.org/ozonaction. The executive summary of the assessment report is available on line at www.unep.org/ozone/pdf/execsumm-sap2002.pdf and background information may be found at www.unep.org/ozone/docs/bkgnd-execsumm-sap2002.doc.0.

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Annual industry consultative meeting: summit follow-up

Forty representatives of national and international industry associations joined representatives of 11 NGOs and officials from UNEP, the United Nations Department of Economic and Social Affairs (UN-DESA), the Office of the United Nations High Commissioner for Human Rights and the International Labour Organization at UNEP's 19th annual Consultative Meeting with Industry Associations.

Much of the meeting in Paris in early October was devoted to follow-up to the World Summit on Sustainable Development (WSSD) and to the sector reporting process that UNEP developed in preparation for WSSD. Speakers addressed WSSD in retrospect from the points of view of the UN, business, labour, NGOs and human rights.

Participants also discussed how quality management and stakeholder engagement could improve business practices, with a focus on tools for putting the Global Compact principles into action.

UNEP and UN-DESA invite industry association representatives to Paris every year to discuss the world environment and provide an opportunity for UN officials and industry representatives to review progress in environmental management, exchange information, discuss production and consumption issues and assess implementation of Agenda 21.

This year a key topic of discussion was the proposal for a ten-year framework of programmes to promote sustainable consumption and production patterns, adopted at WSSD. Participants also heard presentations on multi-stakeholder dialogue, consultation and development of successful partnerships. A special session was devoted to the Climate Legacy project at WSSD, in which investments were invited to offset the greenhouse gas emissions resulting from the summit itself, and travel to and from it.

For more information, contact: Daniel Puig, UNEP DTIE (see address above), Tel: +33 1 44 37 76 29, Fax: +33 1 44 37 14 74, E-mail: daniel.puig@unep.fr, Internet: www.uneptie.org/outreach.

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UNEP working group urges action on mercury

Some 150 experts meeting in Geneva in September under UNEP auspices to consider the environmental and health impacts of mercury concluded there was enough evidence of significant impacts world-wide to warrant international action.

The Global Mercury Assessment Working Group finalized a report to be sent to UNEP's Governing Council in February 2003 that thus could lead to consideration of an international treaty to reduce the risks that releases of mercury into the environment pose for both the environment and human health.

The working group also agreed on other possible options to address the problem, including a non-binding programme to reduce or eliminate the use of mercury in products and industrial processes and to cut mercury emissions and releases, and improved international cooperation and information sharing.

Mercury, a heavy metal, gets into the environment from both natural and human sources. Once released, it cycles among soil, water systems and the atmosphere and can travel thousands of kilometres, contaminating even such remote regions as the Arctic. It also persists in the environment for a long time. Through biological activity in aquatic environments, mercury changes into methyl mercury, a highly toxic compound that can be absorbed by humans and animals and that accumulates in the food chain, so that predatory fish such as tuna and swordfish, freshwater fish such as pike and bass, and mammals such as otters, seals and whales can have large quantities of it in their tissues.

Human activities have roughly tripled the atmospheric levels of mercury since the industrial revolution. Estimates vary widely, but some 5000 to 10,000 tonnes of mercury are thought to enter the atmosphere every year, with half or three-quarters coming from human activities. (See related news, page 97.)

For more information, contact: Michael Williams, UNEP Head of Information Unit for Conventions, CH-1211 Geneva 10, Switzerland, Tel: +41 22 917 8244/196/242 or +41 79 409 1528 (cellular), Fax: +41 22 797 3464, E-mail: Michael.Williams@unep.ch, Internet: www.chem.unep.ch/mercury.

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Broader remit for SWERA energy project

An international effort to pinpoint the most promising wind and solar power sites in developing countries has received a boost with the announcement of a new agreement between UNEP and the National Renewable Energy Laboratory in Colorado, one of the world's leading "green energy" research centres, to expand the pilot Solar and Wind Energy Resource Assessment (SWERA).

The existing project has involved surveys and preparation of high-quality solar and wind maps for 13 developing countries. The new memorandum of understanding increases the number to 14 by including the Maldives, in the Indian Ocean, and expanding the plan for mapping in Bangladesh and geospatial analysis in Sri Lanka.

For more information, contact: Tom Hamlin, UNEP DTIE (see address above), Tel: +33 1 44 37 14 72, Fax: +33 1 44 37 14 74, E-mail: tom.hamlin@unep.fr, Internet: http://swera.unep.net.

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UNEP and automotive industry promote "greener driving"

UNEP and several sponsors from the automotive industry have launched a drive to help promote what some experts call "sustainable mobility". The "Greener Driving" campaign combines videos, comic strips and simple driving tips to help car drivers change their behaviour in ways that benefit them as well as the environment.

Klaus Toepfer, UNEP's Executive Director, welcomed the campaign as encouraging "a smart and effective driving style" that can "decrease stress, increase road safety and reduce fuel consumed per litre driven by up to 25%" while helping cut emissions of local air pollutants and CO_2.

The industry sponsors are BMW, Deutscher Verkehrssicherheitsrat, Ford, Renault and Michelin. The first segment of the campaign, about "mobility mix," encourages use of the most efficient mode of transport for specific traffic situations and personal needs, including public transport and non-motorized transport.

For more information, contact: Martina Otto, UNEP DTIE (see address above), Tel: +33 1 44 37 76 15, Fax: +33 1 44 37 14 74, E-mail: martina.otto@unep.fr, Internet: www.uneptie.org/energy/greener-driving.

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Funding boost for reef action network

The US Agency for International Development and the United Nations Foundation are giving a total of US$ 3 million to support the International Coral Reef Action Network (ICRAN) in a project for the Mesoamerican reef, the largest barrier reef system in the Atlantic Ocean and second largest in the world.

The reef system, which stretches from the northern tip of the Yucatan Peninsula to the Bay Islands, Honduras, is home to more than 70 species of stony coral and over 500 species of fish, including the endangered whale shark, the world's largest fish.

It was also announced that ICRAN's efforts to conserve reefs and develop less environmentally damaging livelihoods for those who depend on them was being expanded into South Asia and the Arabian seas, and that UNEP DTIE would henceforth play a larger role addressing links between coral reefs and tourism. ICRAN is funded through UNEP by the United Nations Foundation.

ICRAN and the WorldFish Center recently announced that their new ReefBase database showed 2002 would likely be the second worst year on record for coral reef bleaching. (See Web Site Highlights.)

For more information, contact: Eric Falt (see above).

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Editorial board member honored with Sasakawa Prize

A longtime member of *Industry and Environment's* Editorial Board has won the prestigious UNEP Sasakawa Environment Prize. The Prize, worth US$ 200,000 and considered one of the most prestigious environmental awards in the world, was presented at the American Folk Art Museum in New York on 19 November 2002.

Ashok Khosla has worked to demonstrate both the theory and practice of sustainable development both as a teacher and by fostering of environment-friendly and commercially viable technologies. These range from village power plants which use agricultural wastes as fuel to mini factories that recycle paper and local enterprises that make low cost roofing tiles.

Much of his recent work has been achieved through Development Alternatives, a group of organizations headquartered in New Delhi, which he founded in 1983, to help bring people and nature directly into the design and implementation of his nation's development strategies.

Mr. Khosla said: "We set out to improve life in the villages of India and the journey led us to new ways for creating sustainable livelihoods – jobs that use local resources to produce goods and services for the local market, thus generating purchasing power, satisfying basic needs and regenerating the ecosystem, all at the same time. Mini enterprise was the means we found most effective to create these livelihoods and good science, technology and management support systems the best instruments for helping these enterprises meet their triple bottom line imperatives: financial, social and environmental sustainability."

For more information, contact: Elisabeth Guilbaud-Cox, Secretary, UNEP Sasakawa Environment Prize, PO Box 30552, Nairobi, Kenya, Tel: +254 20 62 3401, Fax: +254 20 62 3692, E-mail: elisabeth.guilbaud-cox@unep.org, Internet: www.unep.org.

Conference on aviation and the environment

Around 150 representatives of airlines, airport operators, airport authorities, national and local governments, NGOs and citizen groups took part when UNEP DTIE, a local government body and a federation of NGOs sponsored the largest International Conference on Aviation and the Environment in recent memory.

At the daylong event in Cergy, a suburb of Paris, participants agreed to hold workshops on aviation and the environment in a developing country context, produce a guide on good environmental practice and a paper on economic instruments regarding aviation noise emissions, and meet annually.

"Experiences in the oil sector show that sustainability can provide new business opportunities," Jacqueline Aloisi de Larderel, Director of UNEP DTIE, told those attending. "In fact, if companies want to be sound businesses in the long run, they need to listen to NGOs and take environmental challenges seriously."

Co-sponsors of the meeting were the Conseil General du Val d'Oise and Transport and Environment, an umbrella group of NGOs.

For more information, contact: Martina Otto (see above).

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Books & Reports

General

Vital Signs 2002-2003: The trends that are shaping our future

A companion volume to Worldwatch's annual *State of the World* series, *Vital Signs* aims to highlight trends that Worldwatch feels may largely be escaping the notice of the public, the media, politicians and economists. The 45 indicators it offers this year range from global warming, population growth, transgenic crops, HIV/AIDS and Internet use to international trade, charitable giving, soft drink consumption, asthma and urban sprawl.

Worldwatch Institute (2002). Earthscan Publications Ltd., 120 Pentonville Road, London, N1 9JN, UK, Tel: +44 20 7278 0433, Fax: +44 20 7278 1142, E-mail: earthinfo@earthscan.co.uk, Internet: www.earthscan.co.uk. Pbk., 212p. ISBN 1-85383-918-3.

Voluntary Environmental Agreements: Process, Practice and Future Use

Voluntary agreements, usually made between government and business, are seen by some as an important new way to meet environmental objectives and by others as a way for business to avoid taking any real action. The 30 articles in this volume, by authors from around the world, examine both viewpoints and come down by and large in favour of using agreements as one part of a mix of policies and instruments. The editor concludes that for agreements to play this role, however, significant action is needed to make sure they are effective, efficient and equitable.

P. ten Brink, ed. (2002). Greenleaf Publishing, Aizlewood Business Centre, Aislewood's Mill, Nursery Street, Sheffield S38GG, UK, Tel: +44 114 282 4375, Fax: +44 114 282 3476, E-mail: info@green-

leaf-publishing.com. Internet: www. greenleaf-publishing.com. Hbk., 563p. ISBN 1-874719-41-1.

Walking the Talk: The Business Case for Sustainable Development

Going beyond the idea that sustainable development is good for business, the authors maintain that addressing environmental and social problems is essential for future growth. Stephan Schmidheiny, author of 1992's *Changing Course*, joins two other leading participants in the World Business Council for Sustainable Development to argue for a global partnership involving governments, business and civil society in favour of environmental and social initiatives that improve both profits and the planet. Their core message is that business cannot succeed in failing societies; if poorer nations are to raise their standards of living, eco-efficient and socially equitable approaches to development are needed.

C.O. Holliday, S. Schmidheiny and P. Watts (2002). Greenleaf Publishing (see above). Hbk., 288p. ISBN 1-874719-50-0.

A Thousand Shades of Green: Sustainable Strategies for Competitive Advantage

Directed at business leaders, this book is intended to help managers understand what the spread and deepening of environmental awareness means to them and their companies. Managers who view environment as separate from the company's core business will miss out on important opportunities, the authors argue. They see the challenge as essentially one of change management, and hope their book will help business leaders, first, decide what kind of change is most appropriate for their companies; and, second, effect that change. The book aims at allowing managers to tailor strategies to their own circumstances, with a focus on what the authors call "integrated" and "proactive" environmental management responses. Only in the latter does the book really live up to its title and treat sustainability rather than just environment.

P. Winsemius and Ulrich Guntram (2002). Earthscan Publications Ltd. (see above). Hbk., 251p. ISBN 1-85383-846-2.

Product-Service Systems and Sustainability: Opportunities for Sustainable Solutions

In industrialized countries, marketing strategies are increasingly moving in the direction of selling not just a physical product but rather a system of products and services that together can be tailored to client needs. This booklet, a joint effort of UNEP's Production and Consumption Branch and the Interdepartmental Research Centre on Innovation for Environmental Sustainability at the Politecnico di Milano University, examines the potential for sustainability in product-service systems (PSS), particularly in terms of life-cycle approaches. About one-third of the booklet is case studies of companies offering PSS, such as AutoShare of Toronto, which, rather than selling or renting cars, sells memberships in a car-usage system and charges members for the time they use a car.

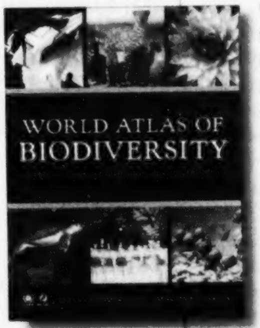
(2002). UNEP, Politecnico di Milano University. Available from EarthPrint Ltd., PO Box 119, Stevenage, SG14TP, UK. Tel:+44 1438 748 111, Fax: +44 1438 748 844, E-mail: orders@earthprint.com, Internet: www.earthprint.com. Pbk., 32p. ISBN 92-807-2206-9.

Developing Value: The Business Case for Sustainability in Emerging Markets

The British consultancy SustainAbility has made its first large-scale study specifically geared towards developing countries and transition economies. Working with the World Bank's International Finance Corporation and Brazil's Ethos Institute, it looked at companies in more than 60 countries, examining opportunities for businesses to benefit from practices that contribute to sustainable development. Refuting the assumption that sustainability is a luxury emerging economies cannot afford, the study finds that companies of all types in all regions can increase commercial return by investing in social and environmental improvements. It reports "interesting differences" between regions, however, and between types and sizes of companies.

(2002). SustainAbility, IFC, Ethos Institute. Available from SustainAbility, 11-13 Knightsbridge, London SW1X 7LY, UK. Tel: +44 207 245 1116, Fax: +44 207 245 1117, Internet: www.sustainability.co.uk. Pbk., 60p. ISBN 1-903168-05-8.

World Atlas of Biodiversity: Earth's Living Resources in the 21st Century



At current extinction rates the Earth loses one major drug every two years. Less than 1% of the world's 250,000 tropical plants have been screened for their pharmaceutical potential. Those are just a sample of the findings in the first comprehensive map-based view of global biodiversity. Prepared by UNEP's World Conservation Monitoring Centre, the atlas draws upon – but significantly goes beyond – the WCMC's *Global Biodiversity* and other earlier work from over the past decade. The authors, additional contributors and map makers cover not only global biodiversity but examine terrestrial, marine and inland water biodiversity in detail, along with the relationship between biodiversity and humans.

B. Groombridge and M.D. Jenkins (2002). UNEP/WCMC. University of California Press, order from University Presses of California, Columbia, & Princeton, Ltd., 1 Oldlands Way, Bognor Regis, West Sussex PO22 9SA, UK, Tel: +44 1243 842165, Fax: +44 1243 842167, E-mail: lois@upccp.demon.co.uk, Internet: www.ucpress.edu. Hbk., 340p. ISBN 0-520-23668-8.

World Atlas of Sustainable Development: Economic, Social and Environmental Data

The concept of sustainable development came to the forefront of global debate at the Rio Earth Summit in 1992 on the realization that current growth patterns were exhausting the Earth's resources and dooming too many people to poverty. Ten years on, the *World Atlas of Sustainable Development* asks whether the situation has changed and what the important issues now are. Like a series of X-rays taken from various angles, the atlas integrates socio-economic, geopolitical and environmental data in 40 maps examining around 30 themes, bridging topics ranging from access to education and the lifestyle gap between North and South to women's rights and climate change. Conceived as a teaching tool, the atlas aims to help make the concept of sustainble development more comprehensible, both to decision makers and the general public. Also available in French (see below).

A-M. Sacquet (2002). Comité 21. Editions Autrement, 77 rue du Faubourg Saint-Antoine, 75011 Paris, France. Tel: + 33 1 44 73 80 00, Fax: +33 1 44 73 00 12, E-mail: contact@autrement.com, Internet: www.autrement.com. Pbk., 80p., ISBN 2-7467-0234-7.

Strategic Environmental Assessment in Transport and Land Use Planning

With increasing emphasis being placed on environmental assessment not just at project level but in the formation of policies, plans and programmes, this study is timely. Claiming to be the first systematic comparative analysis of environmental assessment practice in strategic decision making at all levels, the book looks at selected regions of the UK, Germany and the Netherlands. Based on analysis of 80 assessments in transport and land use planning, it considers not only procedures and methods but also the political and planning systems in which the assessments took place. The author argues for systematic application of a form of comprehensive strategic environmental assessment derived from the major current approaches.

T.B. Fischer (2002). Earthscan Publications Ltd. (see above). Pbk., 284p. ISBN 1-85383-812-8.

Financing for Sustainable Development

This report, part of the input to WSSD, discusses how developing countries can generate resources for sustainable development and seeks to identify innovative approaches involving the public and private sectors both separately and combined. The e-discussion from March-April 2002 that resulted in the first draft of the report is accessible at *www.worldbank.org/devforum/forum_financing.html.*

(2002). UNEP, World Bank, International Monetary Fund. Available from the World Bank, 1818 H Street, NW, Washington, DC, 200433, USA, Tel: +1 202 473 1000, Fax: +1 202 477 6391, E-mail: feedback@worldbank.org, Internet: www.worldbank.org. Pbk., 42p. No ISBN.

The Cartagena Protocol on Biosafety: Reconciling Trade in Biotechnology with Environment & Development?

The manipulation of genes in living organisms has far-reaching implications in a number of areas, not least environment. In cooperation with the Royal Institute of International Affairs, the publishing house Earthscan has collected contributions from many of the key figures involved in the negotiation and adoption of the Cartagena Protocol, and sets them in the context of the agreement's key elements and its implications for environment, trade and development. The full text of the protocol is included, along with selected other documents. There is a Foreword by Klaus Toepfer, Executive Director of UNEP (which administers the Convention on Biological Diversity and the Cartagena Protocol).

C. Bail, R. Falkner and H. Marquard, eds. (2002). Earthscan Publications Ltd. (see above). Hbk., 578p. ISBN 1-85383-836-5.

Sustainable Development Strategies: A Resource Book

Compiled by the International Institute for Environment and Development at the request of, and with collaboration from OECD's Development Assistance Committee and UNDP, this book draws together information from a wide variety of sources on the country-level sustainable development strategies called for in Agenda 21. As a companion to the policy guidance document produced by OECD DAC in 2001, it discusses processes and methodologies in depth, analyzing past and current practice in both developed and developing countries. The focus is on tried and tested approaches actually used in strategic planning, with coverage of measurement and analysis, communications, and financial requirements and resources, among other topics.

(2002). UNDP, OECD. Earthscan Publications Ltd. (see above). Pbk., 358p. ISBN 1-85383-946-9.

Intellectual Property Rights, Trade and Biodiversity

This study of the links between intellectual property protection and biodiversity conservation has been called an invaluable resource for those interested in the trade-environment relationship. Now out in paperback, it covers the main multilateral agreements in the field, including the Convention on Biological Diversity and the TRIPS Agreement, and discusses how the requirements of the biodiversity convention could be integrated into an equitable global regime of intellectual property rights.

G. Dutfield (2000). IUCN and Earthscan Publications Ltd. (see above). Pbk., 238p. ISBN 1-85383-903-5.

Human Development Report 2002: Deepening Democracy in a Fragmented World

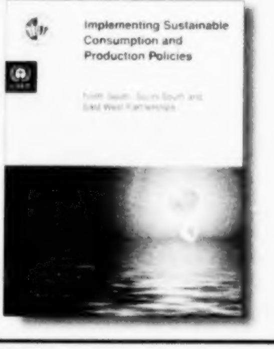
The key publication of the United Nations Development Programme focuses this year on political participation as a dimension of human development. Reducing poverty, the report concludes, depends as much on whether the poor have political power as on their chances for economic progress. While dozens of countries have embraced the idea of democracy in the past 15 years or so, in many the enthusiasm is turning into frustration, it warns. In addition to tackling such topics as "Democratizing security" and "Deepening democracy at the global level," the report features special contributions by writers as diverse as Bono (on debt relief) and Aung San Suu Kyi (on development and human dignity).

(2002). UNDP, Oxford University Press. Available from UNDP Human Development Report Office, 304 East 45th Street, New York, NY 10017, USA, Tel: +1 212 906 3674, Fax: +1 212 906 5161, E-mail: mary.ann.mwangi@undp.org, Internet: http://hdr.undp.org. Pbk., 277p. ISBN 0-19-521915-5.

Implementing Sustainable Consumption and Production Policies: North-South, South-South and East-West Partnerships

In May 2002, CP7, UNEP and Consumers International hosted an informal meeting of 70 experts from 44 countries to promote an international 10-year programme on sustainable production and consumption, later adopted at WSSD in Johannesburg. This report on the meeting formed part of the input to WSSD.

(2002). UNEP, CI. Available from EarthPrint Ltd. (see above). Pbk., 40p. No ISBN.



Training Resource Pack for Hazardous Waste Management in Developing Countries

A joint publication of UNEP and the International Solid Waste Association, with collaboration by the Basel Convention Secretariat, this resource pack for trainers and communicators sums up earlier material and adds visual aids intended to put the message across in a more structured and persuasive way. It includes a CD-ROM that contains not only all the slides and explanatory material in the ring binder but also earlier training manuals on hazardous waste and cleaner production, material related to the Basel Convention and other reference documents. The slides cover regulatory approaches, cleaner production and waste minimization, management practices and treatment processes, in addition to introductory material and basics.

(2002). UNEP, ISWA. Available from EarthPrint Ltd. (see above). Ring binder, 794p. ISBN 92-807-2235-2.

Introduction to Environmental Analysis

Aimed at students of environmental science and analytical chemistry, ***Introduction to Environmental Analysis*** covers the latest techniques in sample extraction and analysis, ***in situ*** sampling and monitoring, automated techniques and the latest alternative methods. Although intended mainly as a textbook, it is also structured as a self-study aid, and features such as the chapter on ultra-trace analysis would make it useful to working environmental analysts as well.

R. Reeve (2002). John Wiley & Sons Ltd., Baffins Lane, Chichester, West Sussex PO19 1UD, UK, Tel: +44 1243 779 777, E-mail: cs-books@wiley.co.uk, Internet: www.wiley.com. Pbk., 301p. ISBN 0-471-49295-7.

Greening the Supply Chain: Enhancing Competitiveness Through Green Productivity

The Asian Productivity Organization, which introduced the cleaner production approach called "green productivity" in 1996, has here compiled papers presented at a 2000 conference on supply chain management. The value of incorporating environmental criteria into purchasing decisions and relationships with suppliers varies according to the type of organization involved, the papers show. Current initiatives described by the authors generally involve either improving coordination with suppliers or requiring them to meet a certain standard, such as ISO 14000. Among the conclusions of the conference was that greening the supply chain will increasingly be a key component of both government and business sustainability and competition strategies.

(2001). Asian Productivity Organization, Hirakawa-cho Dai-ichi Seimei Bldg; 2F, 1-2-10, Hirakawa-cho, Chiyoda-ku, Tokyo 102-0093, Japan, Tel: +81 3 5226 3920, Fax: +81 3 5226

3950, E-mail: apo@apo-tokyo.org, Internet: www.apo-tokyo.org. Pbk., 220p. ISBN 92-833-2290-8.

International Law & the Environment

The first edition of this book came out the year of the Rio Earth Summit; the second edition has been expanded and updated with developments between 1992 and December 2000. There is now a chapter on international trade law and the environment, and treatment of key issues such as climate change, biodiversity, the global environment and human rights has been added or enlarged. Though intended chiefly as a textbook, it would be useful to anyone needing coverage of the main international issues in a single volume.

P. Birnie and A. Boyle (2002). Oxford University Press, Great Clarendon Street, Oxford OX2 6DP, UK, Tel: +44 1865 556767, Internet: www.oup.co.uk. Pbk., 798p. ISBN 0-19-876553-3.

Changing Production Patterns: Learning from the Experience of National Cleaner Production Centres

UNEP and the United Nations Industrial Development Organization began establishing National Cleaner Production Centres in 1994. Today more than 20 NCPCs are operating around the world. This report, drawing on lessons from the first eight years of the programme, offers guidelines to those wishing to establish such centres in their own countries. Using both individual-country case studies and cross-country data, it covers the whole process from finding a host institution to achieving financial independence (as the NCPCs in Brazil, China, the Czech Republic, Hungary, India, Mexico, Slovakia, Tanzania, Tunisia and Zimbabwe have done).

(2002). UNEP, UNIDO. Available from EarthPrint Ltd. (see above). Pbk., 61p. ISBN 92-807-2073-2.

Creating Better Cities with Children and Youth: A Manual for Participation

Produced in cooperation with UNESCO's Growing Up in Cites project, this manual is aimed at anyone involved in community development who wants to involve young people in the process. The methods it recommends have been field tested in varying types of urban settings in both the industrialized and developing worlds. A large part of the book is devoted to a "Participation Toolkit" containing detailed descriptions of methods for developing projects with and for young people.

D. Driskell (2002). UNESCO and Earthscan Publications Ltd. (see above). Pbk., 208p. ISBN 92-3-103815-X (UNESCO) or 1-85383-853-5 (Earthscan).

Making Science for Sustainable Development More Policy Relevant: New Tools for Analysis

The International Council for Science (ISCU) series on science for sustainable development was part of the input to WSSD. This report, number 8 in the series, presents papers on the latest tools for state of environment reporting and related information gathering. The papers, originally prepared for a workshop convened by UNEP and the ISCU's Scientific Committee on the Problems of the Environment, cover reporting frameworks, indicators and indices, and geospatial-based analyis. The report can be downloaded from the ICSU Web site (below)

(2002). ISCU, UNEP. Available from ICSU, 51 bd de Montmorency, 75016 Paris, France; Tel: +33 1 45 25 03 29, Fax: +33 1 42 88 94 31, E-mail: secretariat@icsu.org, Internet: www.icsu.org. Pbk., 28p. ISSN 1683-3686.

Poverty-Environment-Gender Linkages

In an effort to clarify issues in the debate over the links among poverty, environmental degradation and gender disparities, the OECD Development Assistance Committee (DAC) has produced an overview of the relationships between poverty and environment in urban and rural contexts. The report pays particular attention to the "gender dimension" where it is specifically relevant. Originally published in *The DAC Journal*, the report also examines the policy implications of links among these three areas.

(2002). OECD-DAC. Available from OECD Publications, 2 rue André-Pascal, 75775 Paris Cedex 16, France, Tel: +33 1 45 24 82 00, Internet: www.sourceoecd.org. Pbk., 91p. No ISBN.

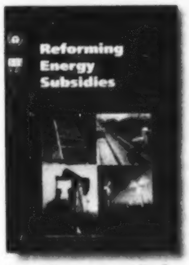
Energy

The Solar Economy: Renewable Energy for a Sustainable Global Future

One of the world's best-known champions of solar energy unrolls his blueprint for a non-fossil, non-nuclear future in this timely translation of the 1999 book *Solare Weltwirtschaft*. Switching from fossil energy to energy from renewable sources – especially solar – would require a new industrial revolution, the author concedes, but he argues that this would provide an unprecedented chance to restructure the international order and give new life to regional economies, in addition to halting much of today's environmental degradation.

H. Scheer (2002). Earthscan Publications Ltd. (see above). Hbk., 347p. ISBN 1-85383-835-7.

Reforming Energy Subsidies



UNEP and the International Energy Agency have pooled much of their analysis of energy subsidy issues in recent years for a series of regional workshops and a synthesis report submitted in 2001 to the United Nations Commission on Sustainable Development. *Reforming Energy Subsidies* summarizes, in non-technical language, the findings and central message of this collaboration. The focus is on issues related to ending or changing subsidies that undermine the goal of sustainable development, but the booklet also examines cases where subsidies can make sense, notably to encourage sustainable energy use.

(2002). UNEP, OECD-IEA. Available from EarthPrint Ltd. (see above.) Pbk., 31p. ISBN 92-807-2208-5.

Policy Interventions to Promote Energy Efficient and Environmentally Sound Technologies in SMI

This report from Asia is based on research geared towards developing strategies and policy instruments to promote energy efficiency in small and medium-scale industries (SMI). It focuses on five branches: brick/ceramics, desiccated coconut, foundries, tea and textiles. The countries covered are China, India, the Philippines, Sri Lanka and Vietnam. The report, part of a programme initiated by the Swedish International Development Cooperation Agency, discusses the role of SMIs in Asian economies and compares existing national policies affecting energy and environment. It concludes that energy efficient and environmentally sound technologies are a suitable option for SMIs, and recommends ways to increase their use.

(2002). Asian Institute of Technology, Regional Energy Resources Information Centre, PO Box 4, Klong Luang, Pathumthani 12120, Thailand, Tel: +66 2 524 5866, Fax: +66 2 524 5875 or 5439, E-mail: enreric@ait.ac.th, Internet: www.ait.ac.th. Pbk., 59p. ISBN 974-8209-01-6.

The Oil and Gas Industry From Rio to Johannesburg and Beyond: Contributing to Sustainable Development

This report by the International Association of Oil & Gas Producers (OGP) and International Petroleum Industry Environmental Conservation Association is an expanded version of the oil industry document that UNEP presented, with 21 other sector reports, at WSSD (see p. 101 and *Industry and Environment* Vol. 25, No. 2). It includes more than 70 case studies aimed at showing how the industry applies the concept of sustainability.

(2002). IPIECA, OGP. Available from IPIECA, 209/215 Blackfriars Road, 5th Floor, London SE1 8EN, UK. Internet: www.ipieca.org. Pbk., 80p. No ISBN.

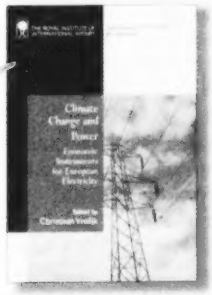
Climate change/ air pollution

Climate Change and the Financial Services Industry

The Climate Change Working Group of the UNEP Financial Initiatives (UNEP FI) commissioned a major two-phase study of how climate change is likely to affect banks, insurance companies, pension funds and other players in the finance sector – and what the sector can do about it. The first part, "Threats and Opportunities", gives the background, stresses the expected financial burden for the sector and explains the need for a long-term ("beyond Kyoto") market-based framework to involve financial institutions in an eventual low-emission economy. The second part, "A Blueprint for Action", examines in detail the possible future role of financial services companies. There is also an eight-page "CEO Briefing" summarizing the findings and recommendations of the study.

(2002). UNEP FI. Available from EarthPrint Ltd. (see above) or in electronic form for downloading at www.unepfi.net. Pbk., 84p. No ISBN.

Climate Change and Power: Economic Instruments for European Electricity



The electricity industry, one of the largest emitters of CO_2, is being affected by market liberalization, technological change and sustainability issues, among other challenges. This book examines the European power sector in the light of such challenges and discusses the industry's options for making the emission cuts that will be needed if international targets are to be reached. Using case studies, an international group of authors describes the main European electricity regimes and the potential of available instruments, with a special focus on economic instruments (including emission trading) and voluntary agreements.

C. Vrolijk, ed. (2002). Royal Institute of International Affairs with Earthscan Publications Ltd. (see above). Pbk., 310p. ISBN 1-85383-822-5.

Climate Change and Sustainable Development: Prospects for Developing Countries

Although developing countries' policies will have an increasingly significant effect on climate change, for most of the individual countries concerned the issue is secondary compared with problems like poverty and lack of food security. This book offers a pragmatic framework for developing countries to use in evaluating their climate change options in the context of general sustainable development policies.

A. Markandya and K. Halsnaes, eds. (2002). Earthscan Publications Ltd. (see above). Pbk., 291p. ISBN 1-85383-910-8.

Industry sectors

Fisheries and the Environment

This two-part report from UNEP DTIE's Economics and Trade Branch is intended to meet demand for increased analysis of the relationships between subsidies, overfishing and other aspects of fishery management. Vol. 1 examines the economic, environmental and social effects of subsidies and explores approaches to developing policy reforms for the sustainable fishery management. Vol. 2 presents results drawn from two country projects aimed at assessing the effects of trade liberalization and trade-related policies and at developing policy packages that could help mitigate negative impacts and enhance positive ones.

(2002). UNEP. Available from EarthPrint Ltd. (see above) or download from www.unep.ch/etu/etp. Pbk. ISSN 1020-0751.

Vol. 1, Fisheries Subsidies and Overfishing: Towards a Structured Discussion

G. Porter. 46p. ISBN 92-807-2126-7.

Vol. 2, Fisheries Subsidies and Marine Resource Management: Lessons Learned from Studies in Argentina and Senegal

54p. ISBN 92-807-2127-5.

Science, Agriculture and Research: A Compromised Participation?

Written by agricultural researchers, and spurred by the controversies surrounding biotechnology, "mad cow" disease and other concerns, this report examines how funding and political contexts affect the agricultural research agenda and its results. The authors describe what they do and why, what drives research methods and programmes, who funds research and how the system functions. They also compare the ways in which agricultural research has evolved in the developed and developing worlds, using a historical analysis based on two main case studies (the UK and Nigeria).

W. Buhler et al. (2002). Earthscan Publications Ltd. (see above). Pbk., 163p. ISBN 1-85383-691-5.

The Role of Financial Institutions in Sustainable Mineral Development

Investors in exploration, development and production of minerals have become increasingly aware of related environmental and social risks, in part because of the financial impact of largely avoidable mining accidents in recent years. This report is intended to help financiers better understand the entire mineral development cycle – from exploration and development to closure and land reclamation – and to encourage them to take all related risks into account. Some of the report's findings were published in *Industry and Environment* Vol. 25, No. 1.

(2002). UNEP. Available from EarthPrint Ltd. (see above) or download at www.mineralresourcesform.org. Pbk., 86p. ISBN 92-807-2145-3.

Green Productivity Practices in Select Industry Sectors

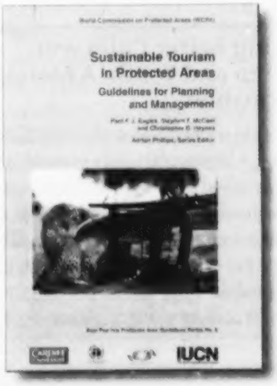
The Asian Productivity Association began research in late 1998 on how, and to what degree, the concept of "green productivity" (cleaner production) was being implemented in six of its 18 member countries: Singapore, Malaysia, Taiwan, Thailand, the Philippines and Japan. Which industry sectors were selected varied by country, but the research as a whole focused particularly on small and medium-sized enterprises. The country experts doing the research found that perceived costs, lack of financing and technical expertise, and a need for new regulatory approaches were the main obstacles to SMEs' applying green productivity.

(2001). Asian Productivity Organization (see above). Pbk., 244p. ISBN 92-833-2289-4.

Sustainable Tourism in Protected Areas: Guidelines for Planning and Management

Tourism, frequently called the world's largest industry, has always had a strong if sometimes adversarial relationship with protected areas. This volume is No. 8 in the Best Practice Protected Area Guidelines series of the World Commission on Protected Areas, a network of experts affiliated with IUCN – The World Conservation Union. UNEP's Tourism Unit and the World Tourism Organization were closely involved in the production of the book, which is aimed at managers of protected areas. It focuses particularly on ways that tourism can contribute to the sustainability of protected area management.

P.F.J. Eagles, S.F. McCool and C.D. Haynes (2002). IUCN, UNEP, WTO. Available from EarthPrint Ltd. (see above). Pbk., 183p. ISBN 2-8317-0648-3.


Sustainable Tourism in Protected Areas
Guidelines for Planning and Management
IUCN

International Yearbook of Industrial Statistics 2002

The eighth issue of the United Nations Industrial Development Organization's annual compendium of statistics on current performance and trends in the manufacturing sector (it covers the industry groups listed in division 3 of International Standard Industrial Classification Revision 2 or, for countries who switched to ISIC Revision 3, table category D).

(2002). UNIDO. Edward Elgar Publishing Ltd. Available from ***Marston Book Services Ltd.****, PO Box 269, Abingdon, OX14 4YN, UK, Fax: +44-1235-465 555, E-mail: direct.order@marston.co.uk, or* ***Edward Elgar Publishing Inc.****, PO Box 574, Williston, VT 05495-0080, USA, Fax: +1 802 864 7626, E-mail: eep.orders@AIDCVT.com. Hbk., 724p. ISBN 1-84064-937-2.*

Regulatory Approaches for the 21st Century: How Government Regulations Interface with Voluntary Initiatives to Improve the Environmental Performance of the Mining Sector

The second international workshop of mining regulators, organized by UNEP and the World Mines Ministries Forum, took place in Toronto, Canada, in March 2002 as part of UNEP's response to the January 2000 cyanide tailings accident at Baia Mare, Romania. This workshop report covers the issues and discussions, and presents the International Cyanide Management Code for gold mining, launched on the occasion of the workshop.

(2002). UNEP. Available from UNEP DTIE, 39-43 quai André-Citroën, 75739 Paris Cedex 15, France, Tel: +33 1 44 37 14 50, Fax: +33 1 44 37 14 74, E-mail: unep.tie@unep.fr, Internet: www.mineralresourcesforum.org. Pbk., 32p. No ISBN.

The Ecology of the New Economy: Sustainable Transformation of Global Information, Communications and Electronics Industries

Growth in Internet use and other new information and communication technologies has been so rapid that little research or analysis has been done on the impact this phenomenon has had, and is likely to have, on businesses' ability to deal with the global sustainability challenge. The editors set out to explore sustainability concerns arising from the "information economy," particularly the risk that issues concerning technology, research and electronic commerce will be examined in isolation from corporate sustainability objectives. Includes case studies from industrialized and developing countries.

J. Park and N. Roome, eds. (2002). Greenleaf Publishing (see above). Hbk., 284p. ISBN 1-874719-47-0.

National/regional

Africa Environment Outlook: Past, Present and Future Perspectives

Africa faces sharp increases in air and water pollution, land degradation, drought and wildlife loss unless urgent action is taken, according to the first comprehensive regional analysis ever made of the continent's environment. At the request of the African Ministerial Conference on the Environment, UNEP examined the state of Africa's environment from 1972 to 2002, the main forces behind environmental change and the effects on the region's social and economic development. In a format similar to that of the recent *Global Environment Outlook 3*, the book discusses environmental themes such as atmosphere, forests and urban areas, and looks at different scenarios for developments up to 2032. Also available in French (see below).

(2002). UNEP, AMCEN. Available from EarthPrint Ltd. (see above). Pbk., 422p. ISBN 92-807-2101-1.

Integrated Assessment of Trade Liberalization and Trade-Related Policies

In six country studies and a synthesis report, UNEP DTIE's Economics and Trade Branch (ETB) presents results from the second round of its country projects on trade liberalization. National teams carried out the country studies, which were monitored by national steering committees. The synthesis report and its summary studies were done by ETB in collaboration with the United Nations Conference on Trade and Development.

(2002). UNEP. Available from EarthPrint Ltd. (see above). Pbk. ISSN 1683-8157.

Country Studies:

Argentina Fisheries Sector, 118p. ISBN 92-807-2216-6.

Cotton Sector in China, 66p. ISBN 92-807-2217-4.

Ecuador Banana Sector, 78p. ISBN 92-807-2218-2.

Export Crop Sector in Nigeria, 128p. ISBN 92-807-2219-0.

Fisheries Sector in Senegal, 81p. ISBN 92-807-2220-2.

Forestry Sector in Tanzania, 55p. ISBN 92-807-2215-8.

Synthesis Report:

UNEP Country Projects – Round II, 132p. ISBN 92-807-2246-8.

Workshop on Sustainable Consumption for Latin America & Caribbean

Held in São Paulo, Brazil, in November 2001, this workshop gathered professionals from academia, government, NGOs, the media and other business to develop input for WSSD on sustainable consumption issues in the region. Findings from the workshop were included in the Global Status Report on Sustainable Consumption submitted to WSSD. Participants drew up an action plan, included here along with the background paper prepared by UNEP's Regional Office for Latin American and the Caribbean (ROLAC), which organized the event along with UNEP DTIE, Brazilian authorities and the Brazilian unit of Carl Duisberg Gesellschaft.

(2002). UNEP. Available from UNEP DTIE (see above) or ROLAC, Boulevard de los Virreyes 155, Lomas de Virreyes, CP 11000, Mexico City, Mexico, Tel: +52 55 5 202 6394 or 4841, Fax: +52 55 5 202 0950, E-mail: industria@rolac.unep.mx., Internet: www.rolac.unep.mx. Pbk., 80p. No ISBN.

Hazardous Waste Management: Policies and Practices in Asian Countries

Hazardous waste is an issue that, as this study points out, has only begun to be dealt with in most developing countries, including those of Asia. The Asian Productivity Organization began studying the situation in eight of its member countries in 2000, and this report is based on its findings. The study includes national reports for China, India, Iran, Pakistan, Singapore, Sri Lanka, Thailand and Vietnam, a synthesis report, and the action plans that were formulated as a result of the project.

(2001). Asian Productivity Organization (see above). Pbk., 383p. ISBN 92-833-2302-5.

Editions françaises

Mettre en pratique le développement durable – Quels processus pour l'entreprise

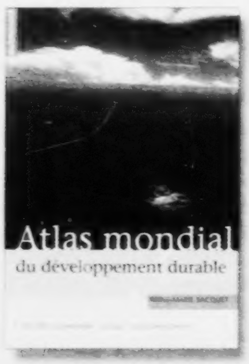
Lorsqu'on est dirigeant d'entreprise, comment satisfaire les actionnaires, les clients et le personnel tout en répondant aux exigences de la société civile ? Comment devenir socialement et environnementalement responsable tout en créant davantage de valeur ? Telles sont les deux principales questions auxquelles ce livre tente de répondre. Gouvernance, intégration du développement

durable dans les systèmes de management, mesure et évaluation de la performance globale, dialogue avec les parties prenantes, rendre compte aux parties prenantes, toutes ces questions sont passées en revue pour donner au dirigeant d'entreprise un guide opérationnel, une méthodologie d'action pour engager l'entreprise dans une démarche de développement durable.

Olivier Dubigeon (2002). Editions Village Mondial/Pearson Education, 13 rue de La Grande Chaumière, 75006 Paris, France, Tél. : +33 1 44 32 08 00, Fax : +33 1 43 25 43 37. 319p. ISBN 2-84211-206-7.

Atlas mondial du développement durable – Concilier économie, social, environnement

Le concept du développement durable est né au Sommet de la Terre, en 1992 à Rio, sur le constat de l'échec d'un mode de croissance épuisant la planète et reléguant la grande majorité des peuples dans la pauvreté. Quel est le constat en 2002 ? Quelles questions se poser ? C'est l'objet de cet *Atlas mondial du développement durable* qui propose une radioscopie du monde, à travers des angles de vue indissociables, croisant des données socio-économiques, géopolitiques, environnementales. Trente planches et quarante cartes jettent des passerelles entre l'accès à l'éducation, les écarts de niveaux de vie au Nord et au Sud, les droits civiques des femmes, les changements climatiques ou la solidarité internationale. Conçu comme un outil pédagogique, L'atlas contribue à rendre le concept du développement durable accessible à tous, décideurs et grand public.



Il existe également une édition anglaise de l'atlas (voir plus haut).

Anne-Marie Sacquet (2002). Editions Autrement, 77 rue du Faubourg Saint-Antoine, 75011 Paris, France, Tél. : + 33 1 44 73 80 00, Fax : + 33 1 44 73 00 12. 80 p. ISBN 2-7467-0234-7.

L'Avenir de l'environnement en Afrique

Selon la première analyse régionale détaillée jamais réalisée sur l'état de l'environnement en Afrique, on observera sur ce continent de fortes augmentations de la pollution de l'air et de l'eau, un accroissement significatif de la dégradation des sols et de la sécheresse et une diminution importante des ressources fauniques si des mesures d'urgence ne sont pas prises. A la demande de la Conférence des ministres africains de l'environnement , le Programme des Nations Unies pour l'environnement a dressé un état de l'environnement en Afrique de 1972 à 2002, analysé les forces à l'œuvre dans les changements qui se produisent dans l'environnement et étudié leurs répercussions sur le développement social et économique de la région. Semblable par sa structure à *L'avenir de l'environnement mondial 3*, le rapport traite de sujets tels que l'atmosphère, les forêts, les centres urbains, et il présente plusieurs scénarios décrivant les évolutions possibles d'ici 2032.

Il existe également une édition anglaise de ce rapport (voir plus haut).

(2002). PNUE, AMCEN. Distribué par EarthPrint Ltd., PO Box 119, Stevenage, SG14TP, UK, Tél. : +44 1438 748 111, Fax : +44 1438 748 844, Mél : orders@earthprint.com, Internet : www. earthprint.com. 422p. ISBN 92-807-2101-1.

Web Site Highlights

Environment news out of Africa

www.earthwire.org/africa

UNEP/GRID-Arendal has launched an environmental news portal covering 14 southern African countries. EarthWire Africa musters a team of African journalists to review more than 40 newspapers for environment-related stories, providing a free daily overview of environmental news from Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Republic of Congo, Seychelles, Swaziland, South Africa, Tanzania, Zambia, and Zimbabwe. The stories can be viewed by country, topic or time period, and a search engine allows users to search for issues and keywords in the archive. Press releases and news from research organizations, the public sector and environmental organizations will eventually be included.

For more information, contact: Svein Tveitdal, Managing Director, GRID-Arendal, Tel: +47 90 58 90 32 (mobile), E-mail: tveitdal@grida.no.

AFP launches CSR news service

www.globalethicsmonitor.com

The news agency Agence France-Presse and AFX News, its global business wire, have launched AFX Global Ethics Monitor, a media service designed for professionals in the fields of corporate risk management, social responsibility, corporate governance and socially responsible investing. The service features news, research and data to support decision-making on management of screened investment portfolios and particular aspects of social, environmental and reputational risk. Believed to be the first professional-grade service of its kind, it draws on a special team of journalists in New York, plus the AFP and AFX networks of journalists in 165 countries. The secure, password-protected Web site allows highly specific searches and for tools for organizing news and research content along user-defined themes.

For more information, contact: Graham Parry (UK/EU), Tel: +44 20 7422 4812, or Brian Baloga (North America), Tel: +1 212 735 9280, E-mail: sales@globalethicsmonitor.com.

ReefBase shows rise in coral bleaching

www.reefbase.org

A global coral reef information system called ReefBase, with data on bleaching events dating back to 1963, shows that the phenomenon is on the rise, and scientists link it to climate change. Over 430 cases of bleaching, a phenomenon caused by (among other stresses) higher seawater temperatures that can damage or even kill a reef, were documented in the first ten months of 2002, the majority of them affecting Australia's Great Barrier Reef. The findings were released by the WorldFish Center and the International Coral Reef Action Network (ICRAN), sponsors of the site. ReefBase holds over 3,800 records, including information on the severity of bleaching.

For more information, contact: Eric Falt, UNEP Spokesperson and Director, Division of Communications and Public Information, Tel: +254 2 623292, E-mail: eric.falt@unep.org.

maESTro's new incarnation

www.unep.or.jp/maestro2

maESTro, the free searchable directory on environmentally sound technology (EST) run by UNEP's International Environmental Technology Centre in Japan, has been reborn as maESTro II. Aimed chiefly at decision makers in local and national governments, maESTro is a global repository of EST information, facilitating decisions about selection, transfer, adoption and use of such technologies.

For more information, contact: International Environmental Technology Centre, 2-110 Ryokuchi Koen, Tsurumi-ku, Osaka 538-0036, Japan, Tel: +81 6 6915 4581, Fax: +81 6 6915 0304, E-mail: maestro@unep.or.jp.

THE UNEP DIVISION OF TECHNOLOGY, INDUSTRY AND ECONOMICS

Current uses and development of natural resources, technologies and production processes, as well as urbanization patterns, have negative effects on human health and the environment. This is illustrated by unsustainable use of water, land and energy, air and water pollution, persistent and toxic bio-accumulative chemicals in the food chain, and other industry-related problems.

To have a healthy environment, we need to change how we produce and consume goods and services. This change involves revising and developing economic policies and trade practices, so as to integrate environmental issues in the planning and assessment processes.

UNEP's Division of Technology, Industry and Economics (UNEP DTIE) was created in 1998 to help decision-makers in governments, local authorities and industry develop and adopt policies and practices that:

- are cleaner and safer;
- use natural resources efficiently;
- ensure adequate management of chemicals;
- incorporate environmental costs;
- reduce pollution and risks for humans and the environment.

UNEP DTIE, whose main office is in Paris, is composed of:

◆ **The International Environmental Technology Centre (Osaka)**, which promotes the adoption and use of environmentally sound technologies, with a focus on the environmental management of cities and freshwater basins, in developing countries and countries in transition.

◆ **The Production and Consumption Branch (Paris)**, which fosters the development of cleaner and safer production and consumption patterns that lead to increased efficiency in the use of natural resources and reductions in pollution.

◆ **The Chemicals Branch (Geneva)**, which promotes sustainable development by catalyzing global actions and building national capacities for the sound management of chemicals and the improvement of chemical safety world-wide, with a priority on Persistent Organic Pollutants (POPs) and Prior Informed Consent (PIC, jointly with FAO).

◆ **The Energy and OzonAction Branch (Paris)**, which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition, and promotes good management practices and use of energy, with a focus on atmospheric impacts. The UNEP/RISØ Collaborating Centre on Energy and Environment supports the work of this Branch.

◆ **The Economics and Trade Branch (Geneva)**, which promotes the use and application of assessment and incentive tools for environmental policy, and helps improve the understanding of linkages between trade and environment and the role of financial institutions in promoting sustainable development.

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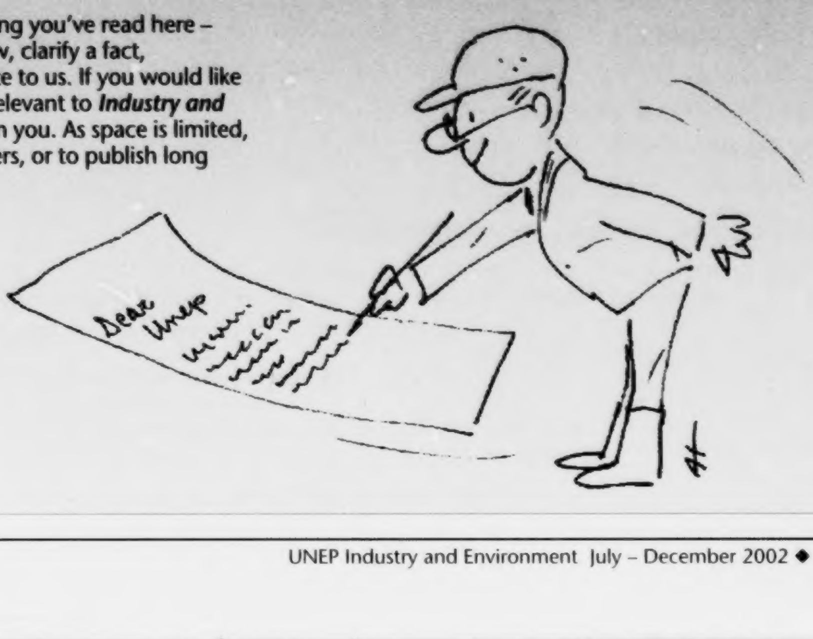

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